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(51) INT CL<sup>7</sup>

E04H 15/40

(52) UK CL (Edition R)

E1D DTNF

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US 5301705 A

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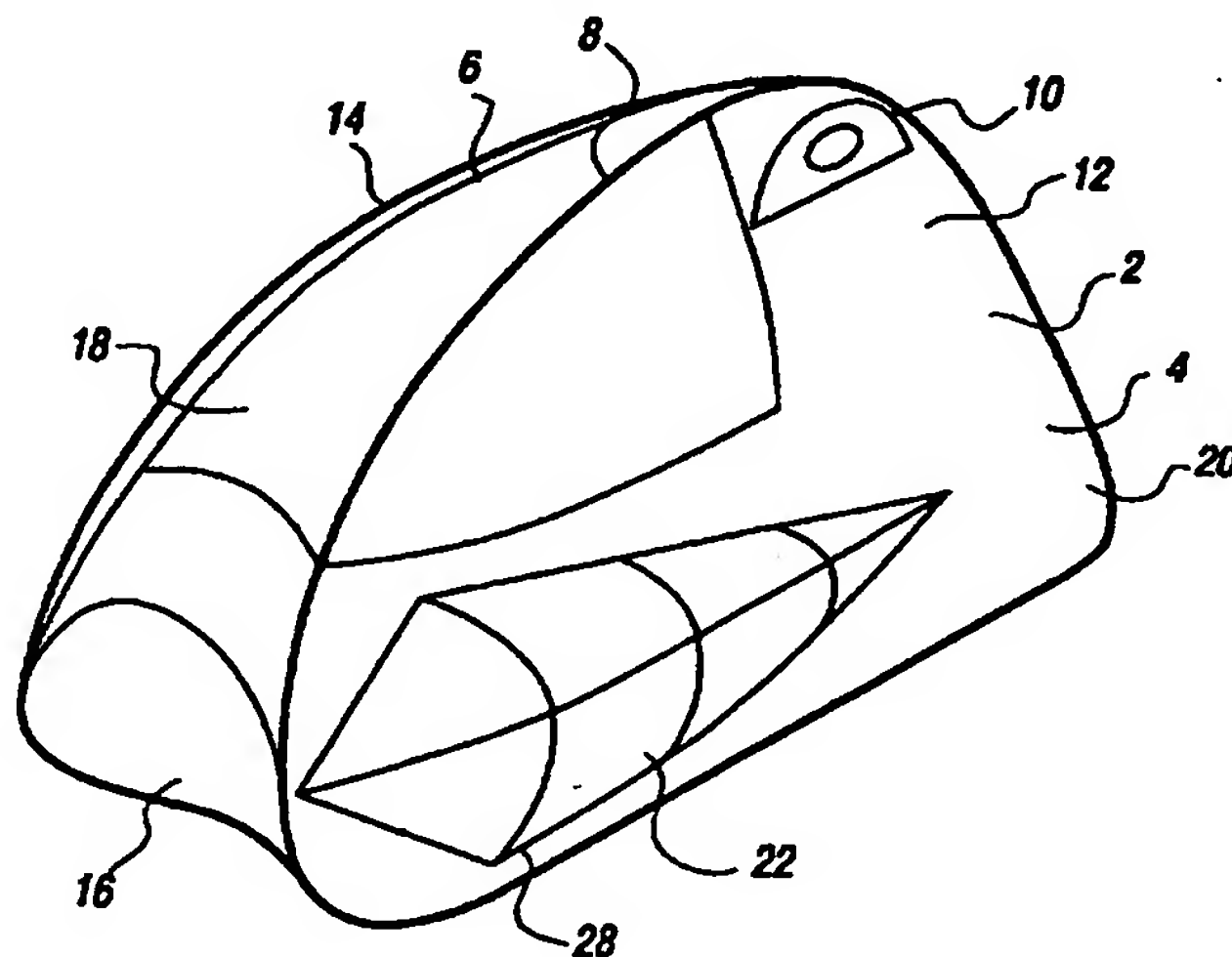
INT CL<sup>6</sup> E04H

Online: WPI, EPODOC

(54) Abstract Title

**Collapsible structure**

(57) A structure has sheet material 2 stretched over frame members 8, 14 so as to give relatively planar walls, characterised by additional non planar features 22 which can be moved between flattened and erected conditions to enhance the aesthetic appearance of the structure.



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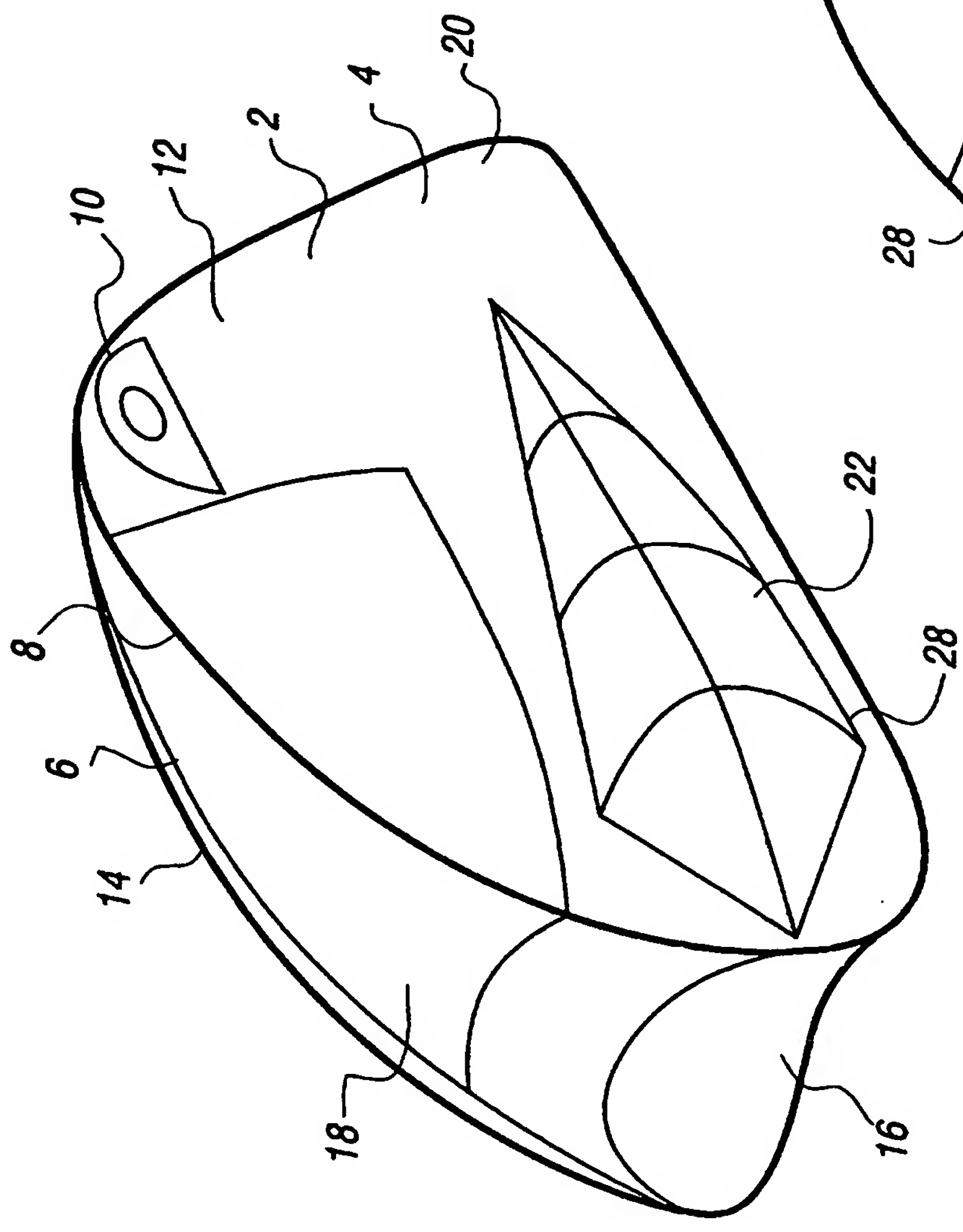


FIG 1A

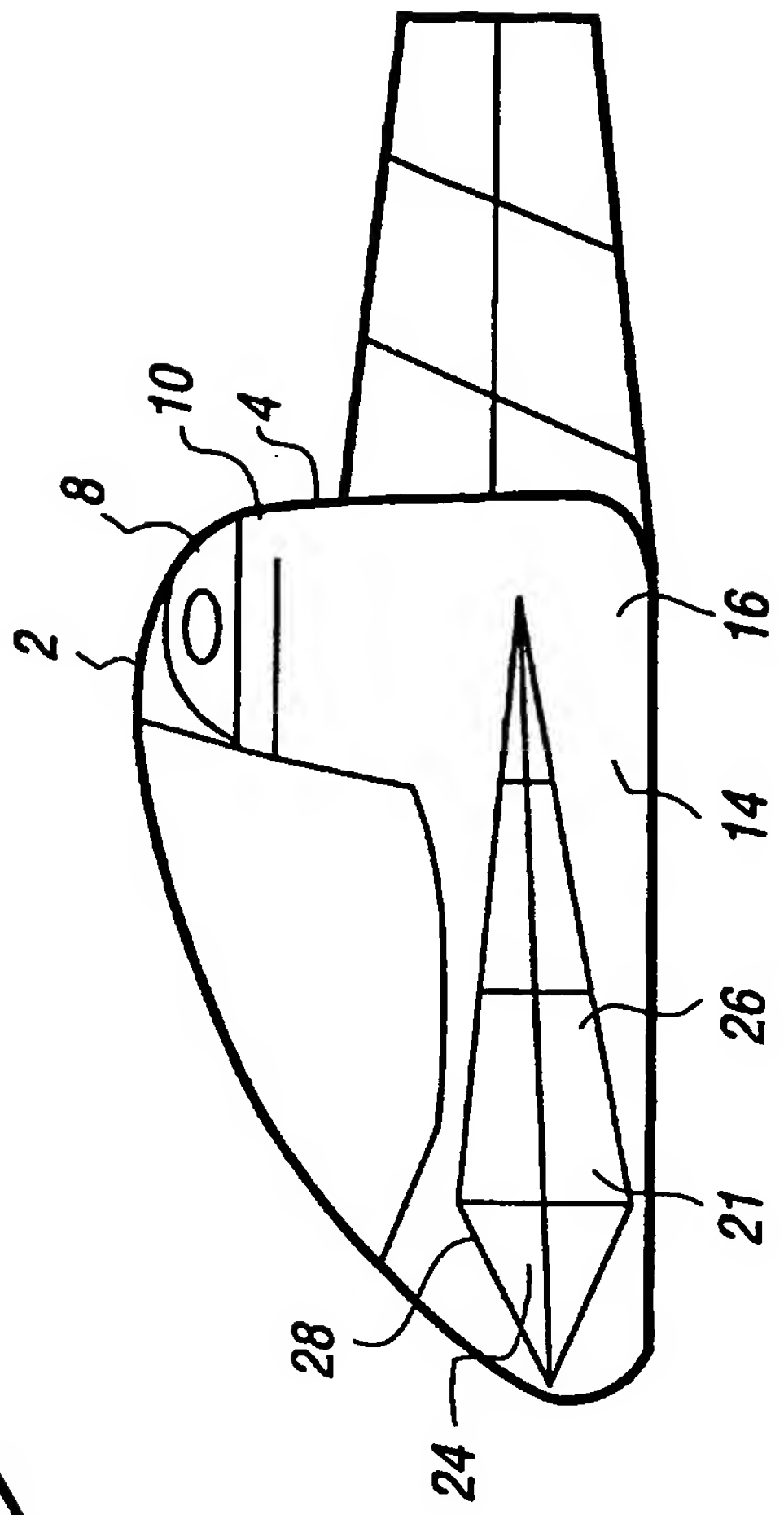


FIG 1B

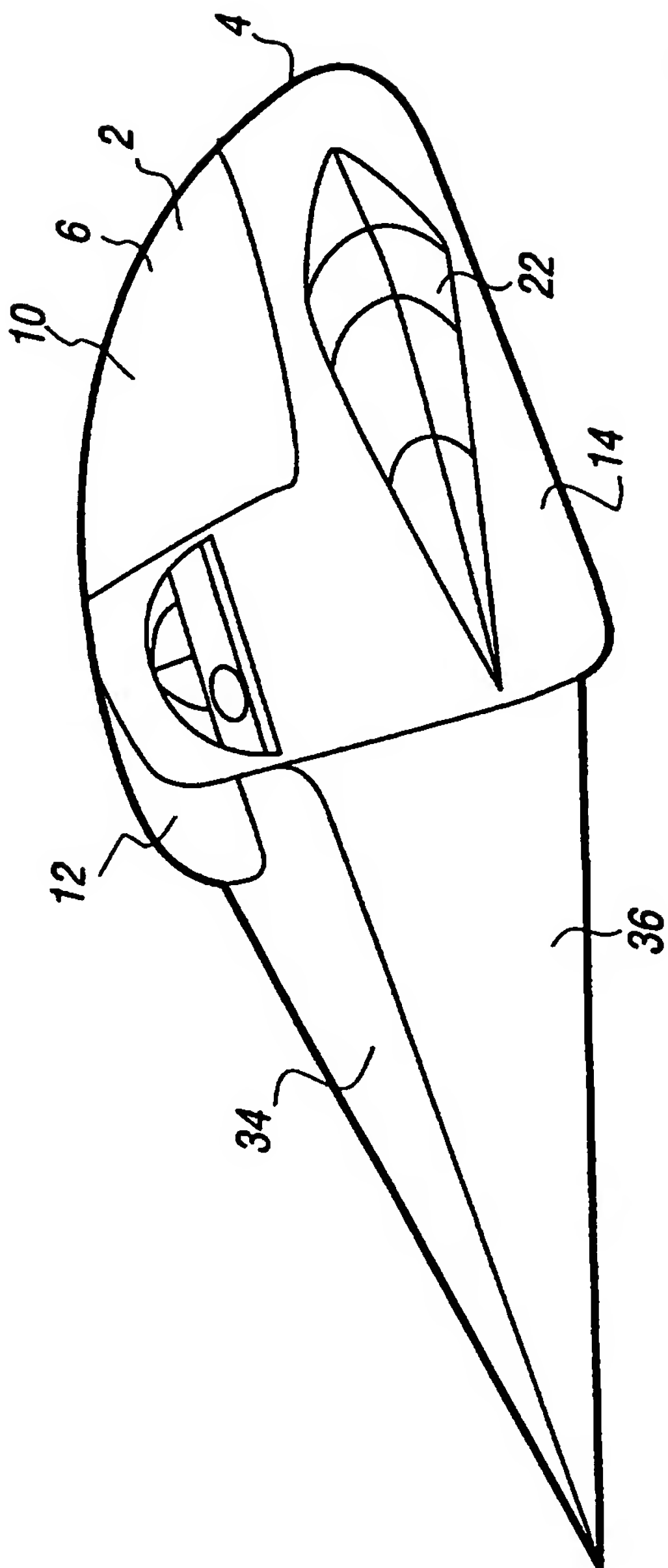


FIG 1C

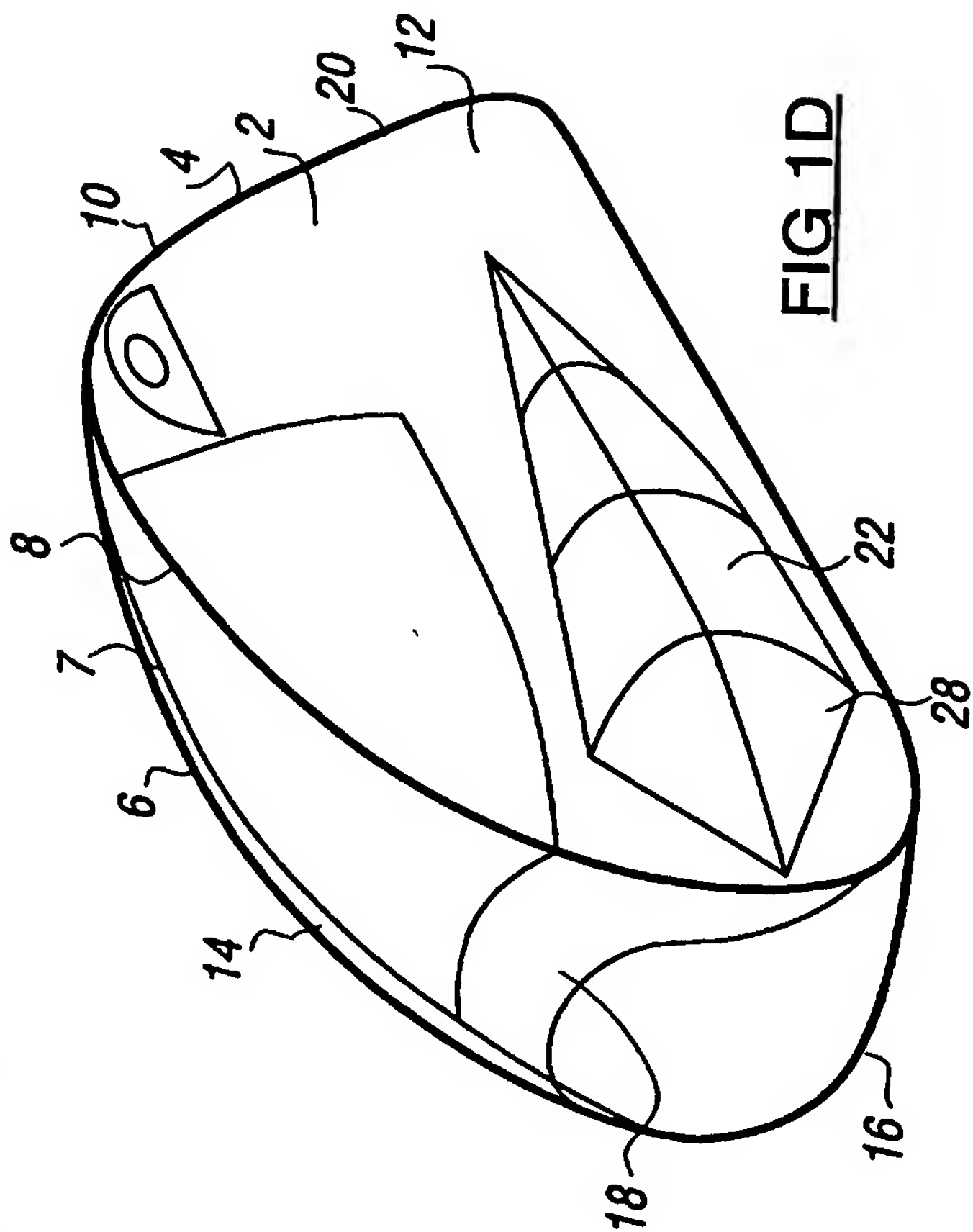


FIG 1D

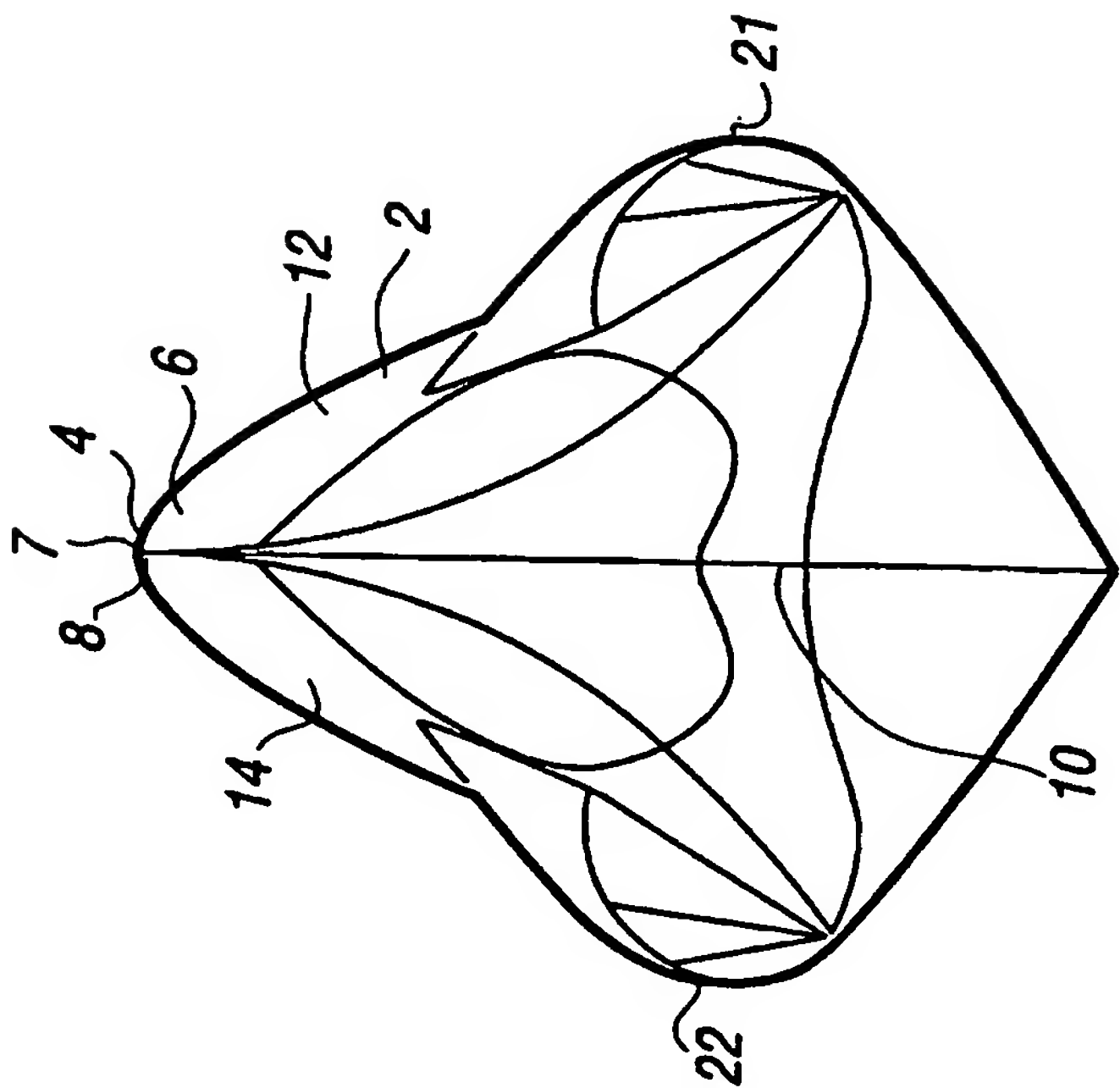


FIG 1E

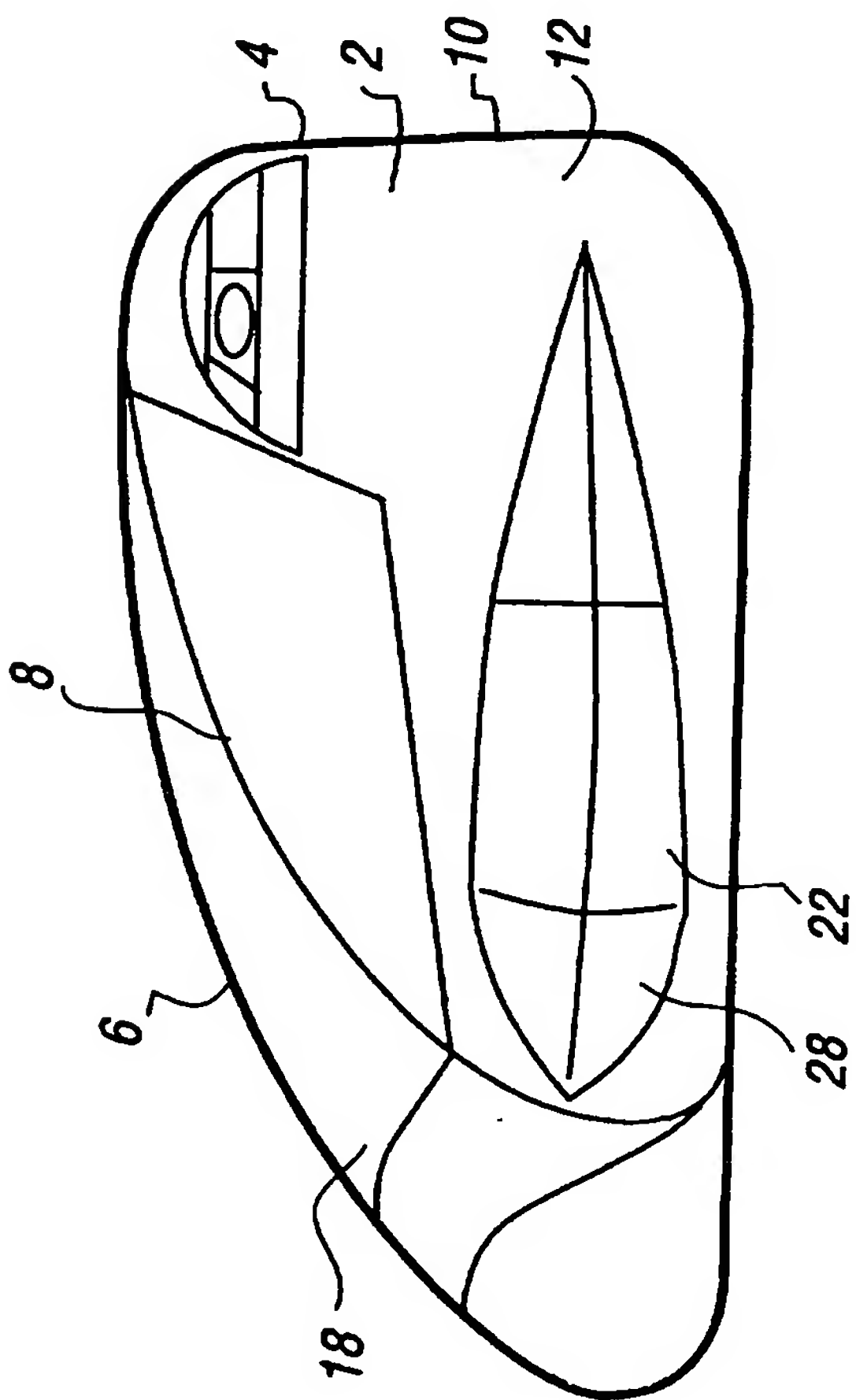


FIG 1F

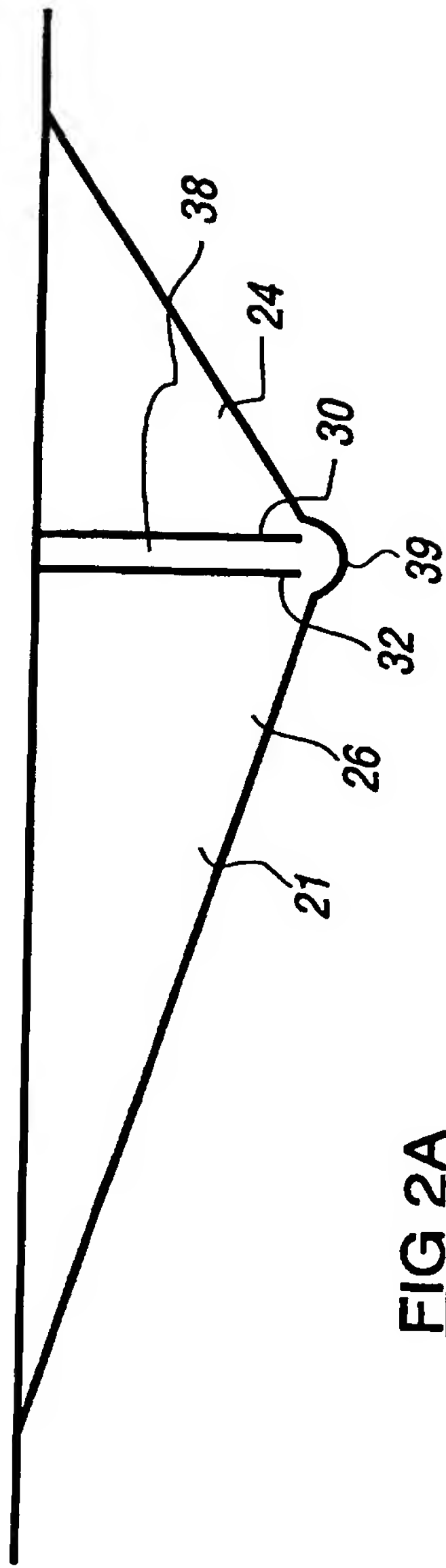


FIG 2A

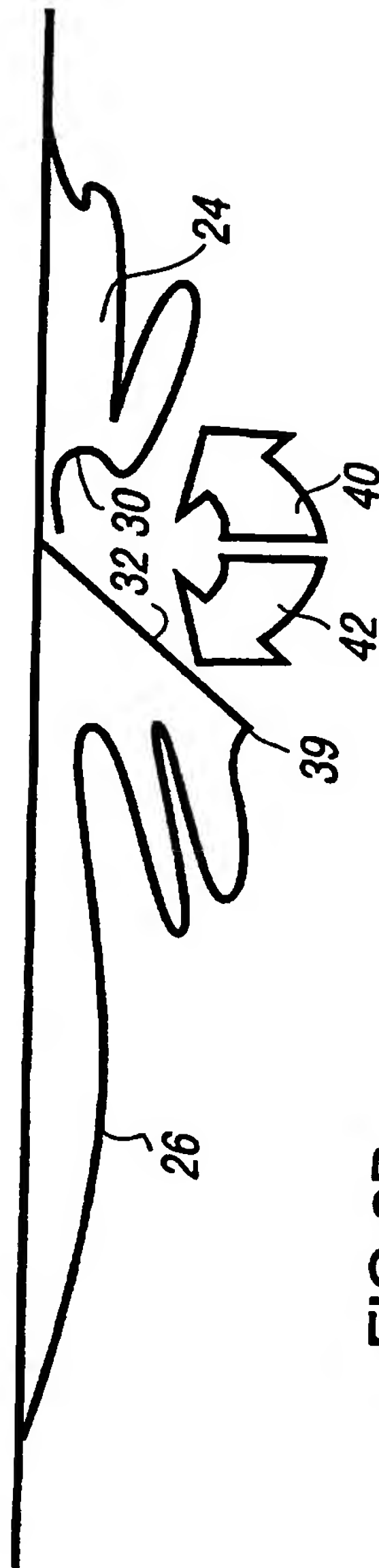


FIG 2B

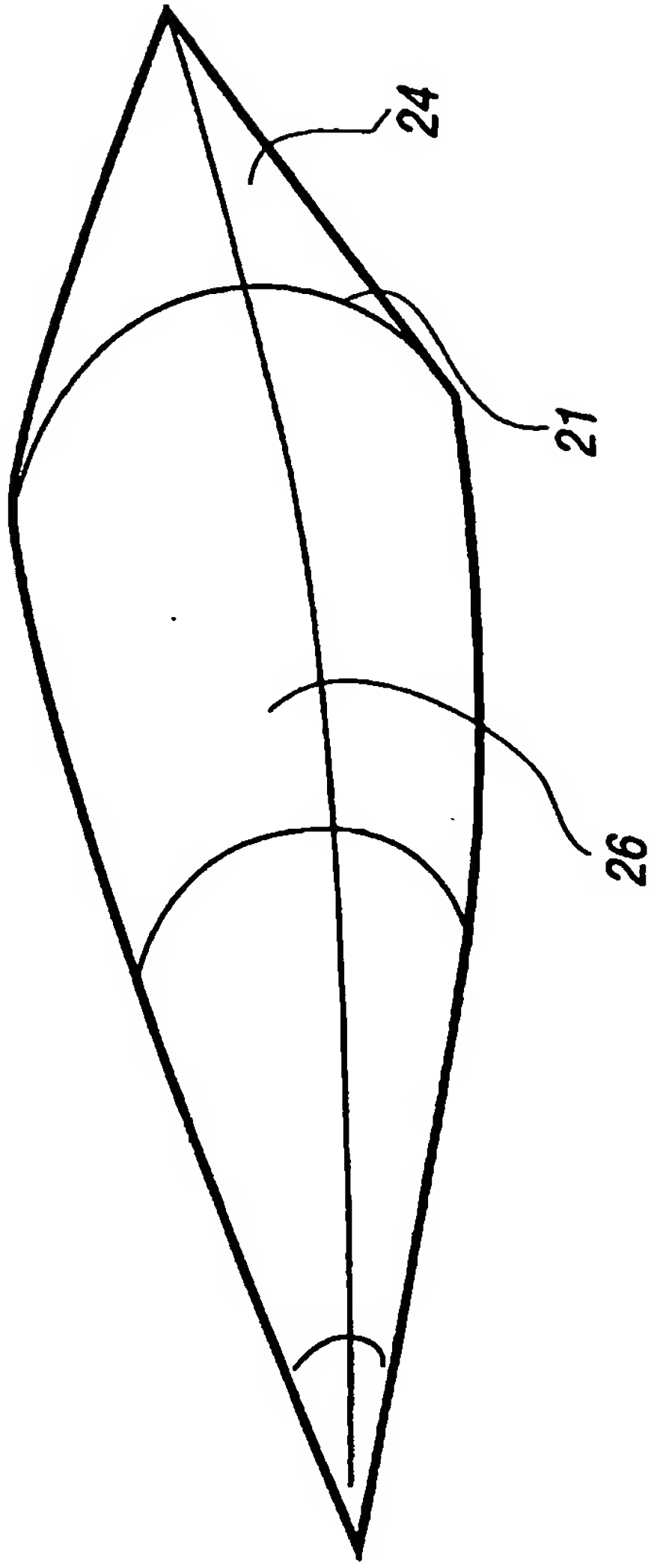


FIG 2C

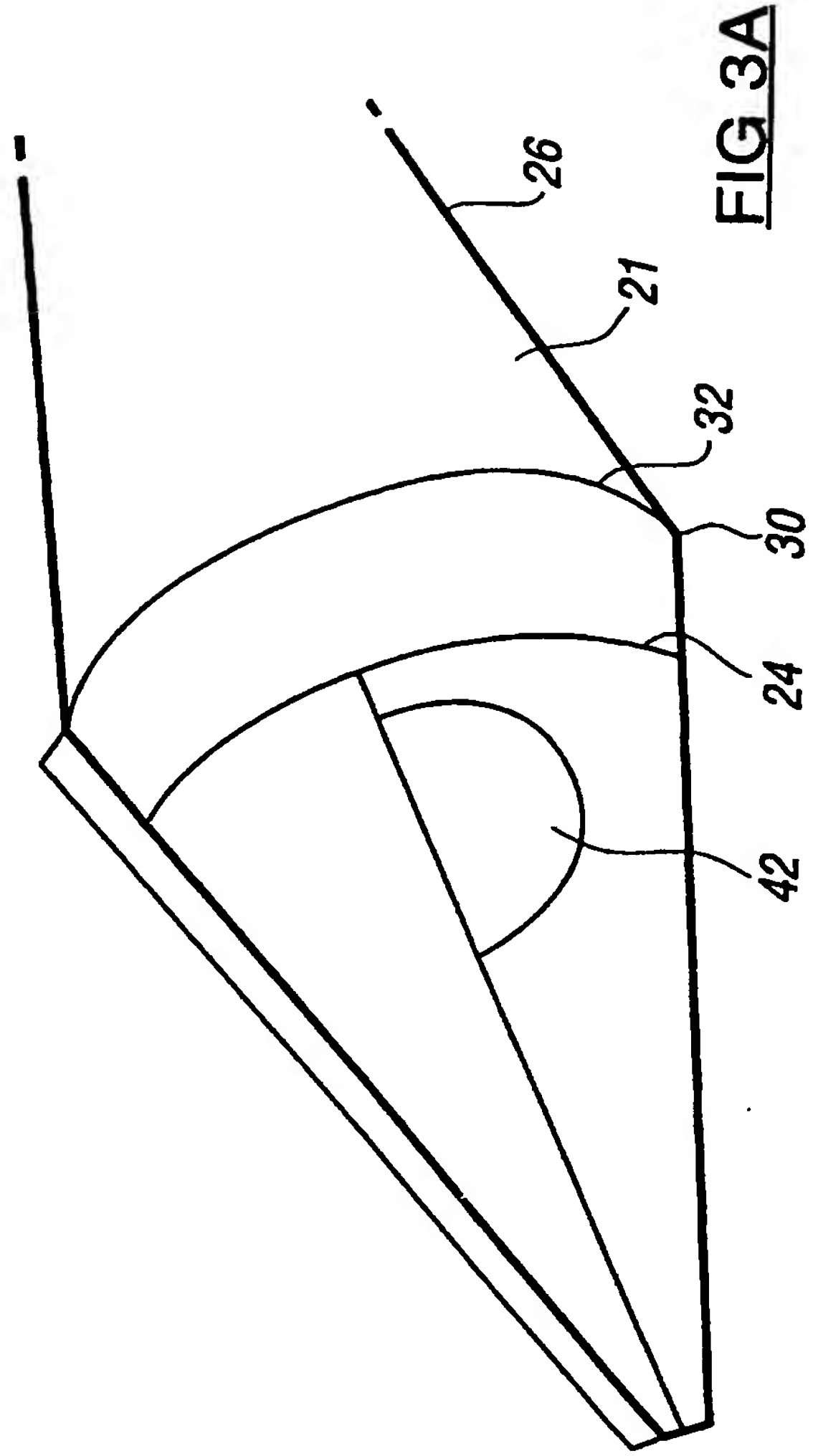


FIG 3A

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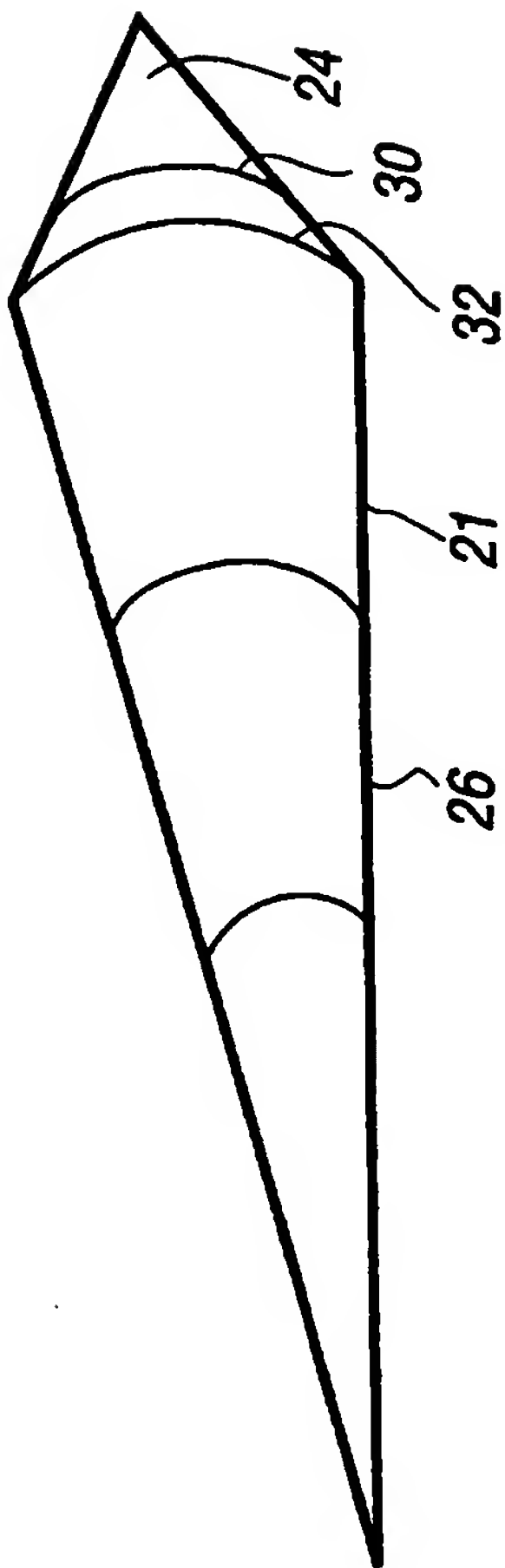


FIG 3B

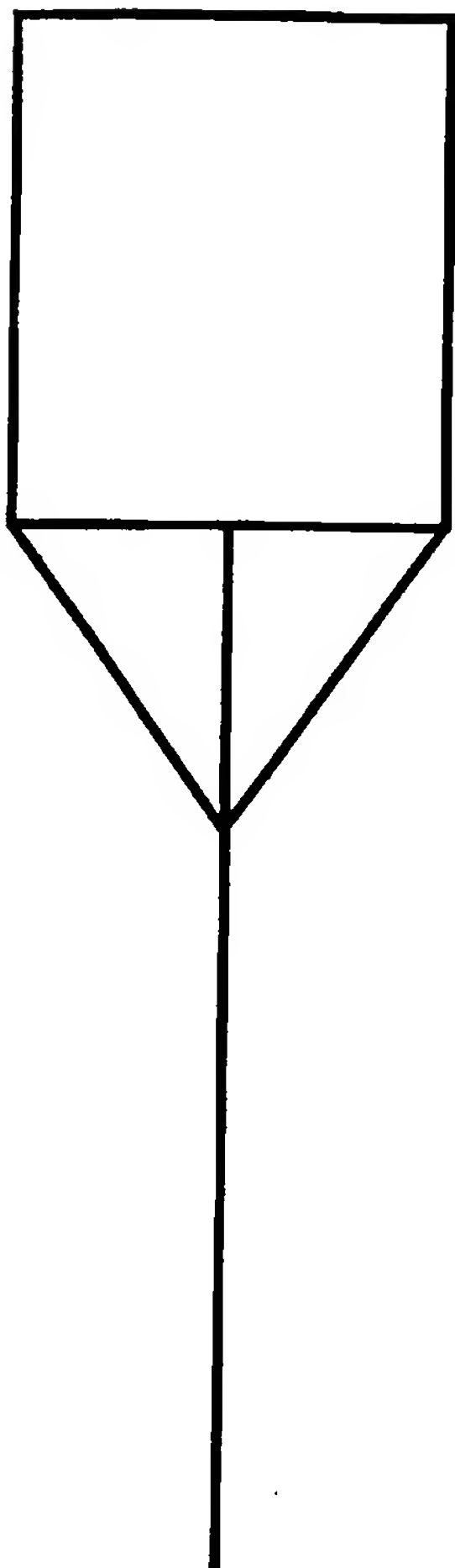


FIG 4A

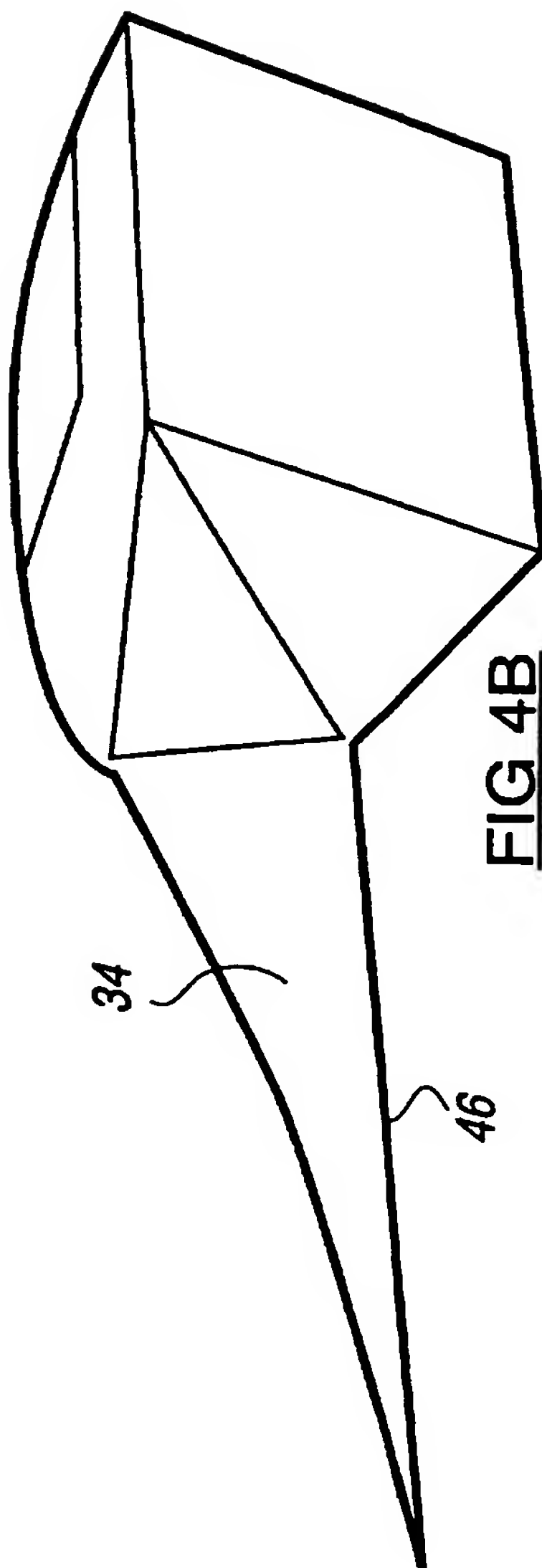


FIG 4B

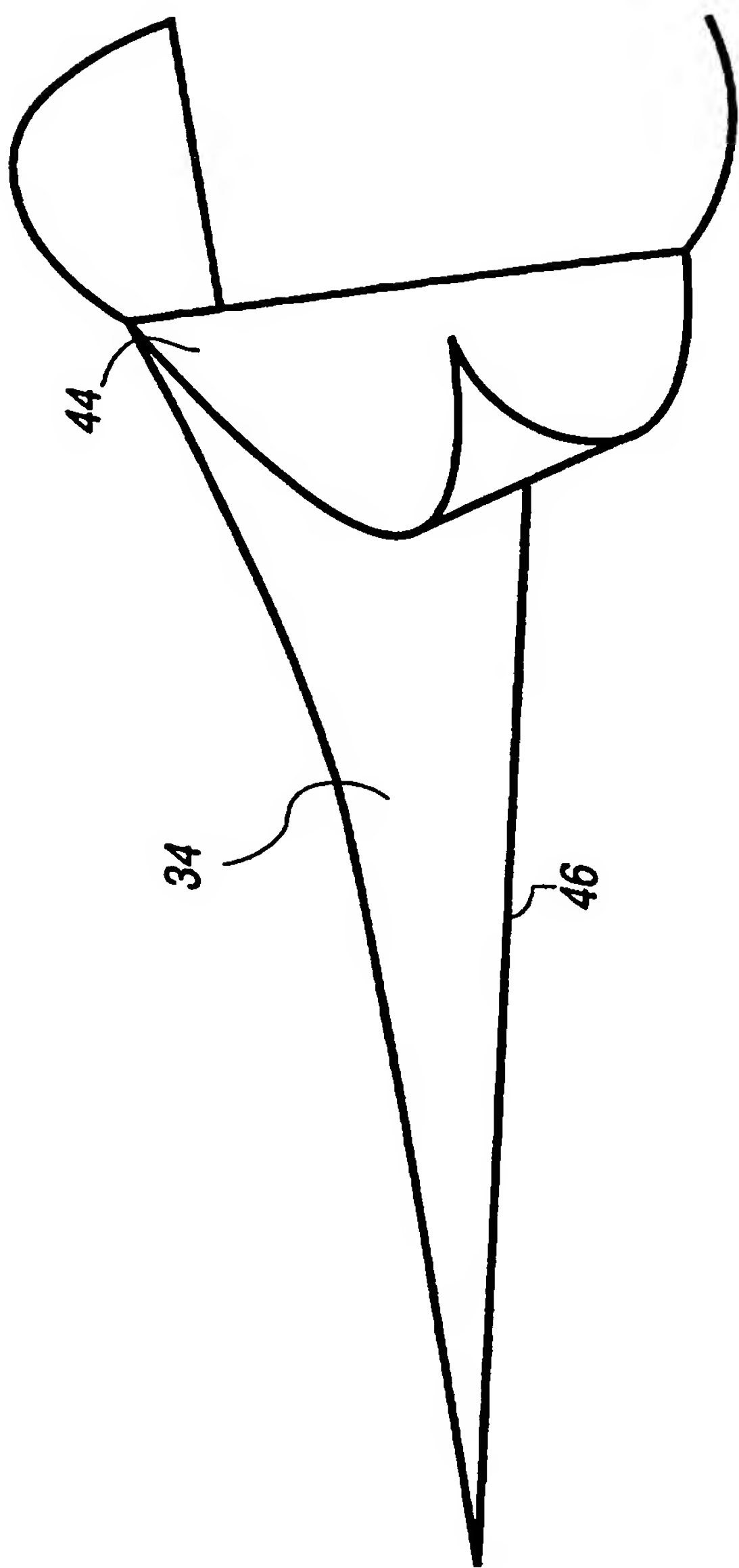


FIG 4C

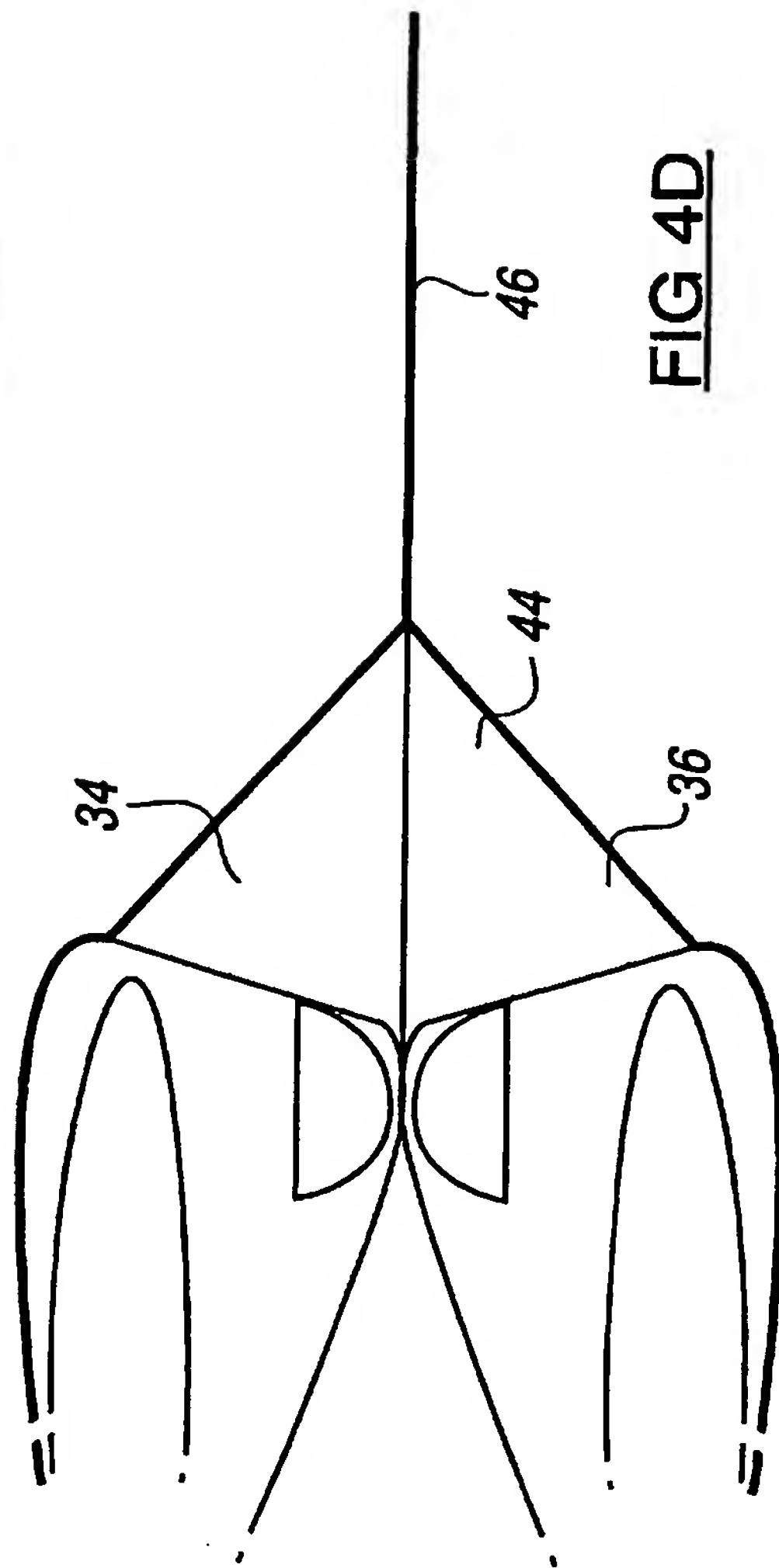
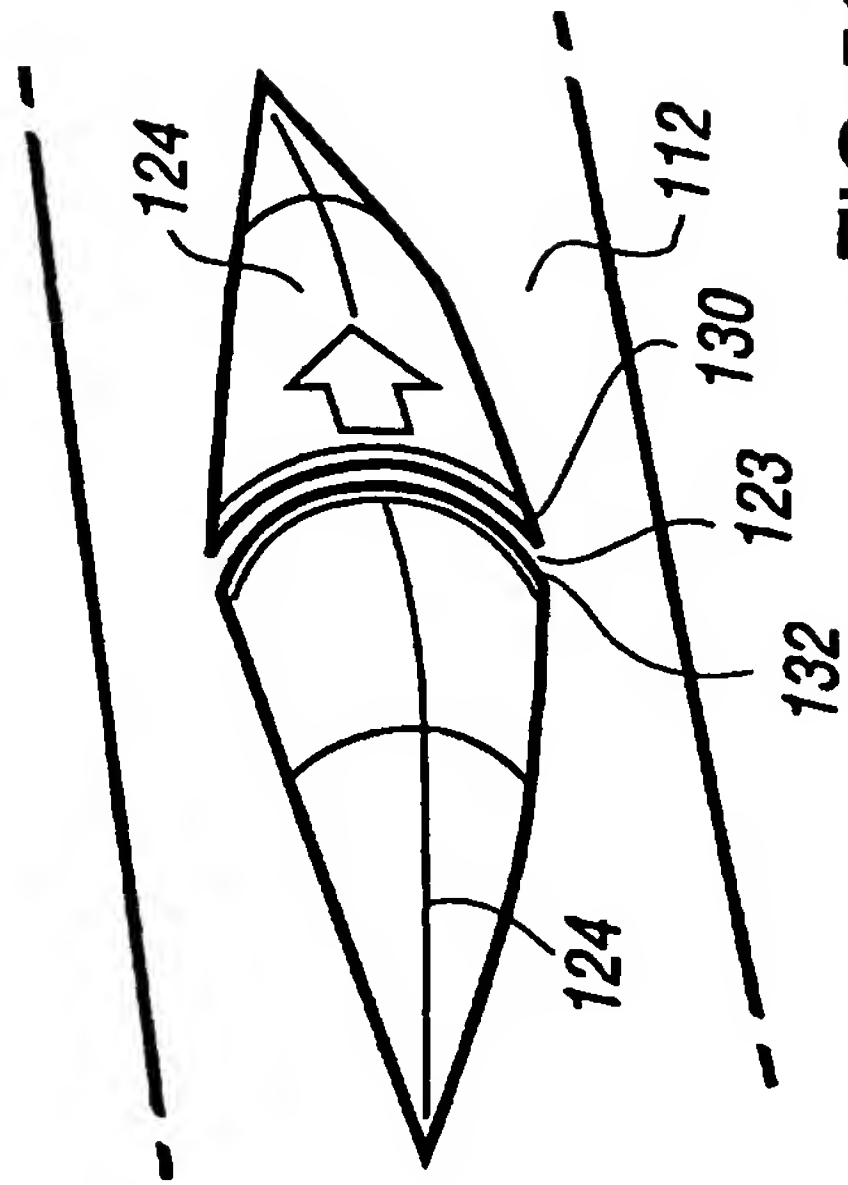
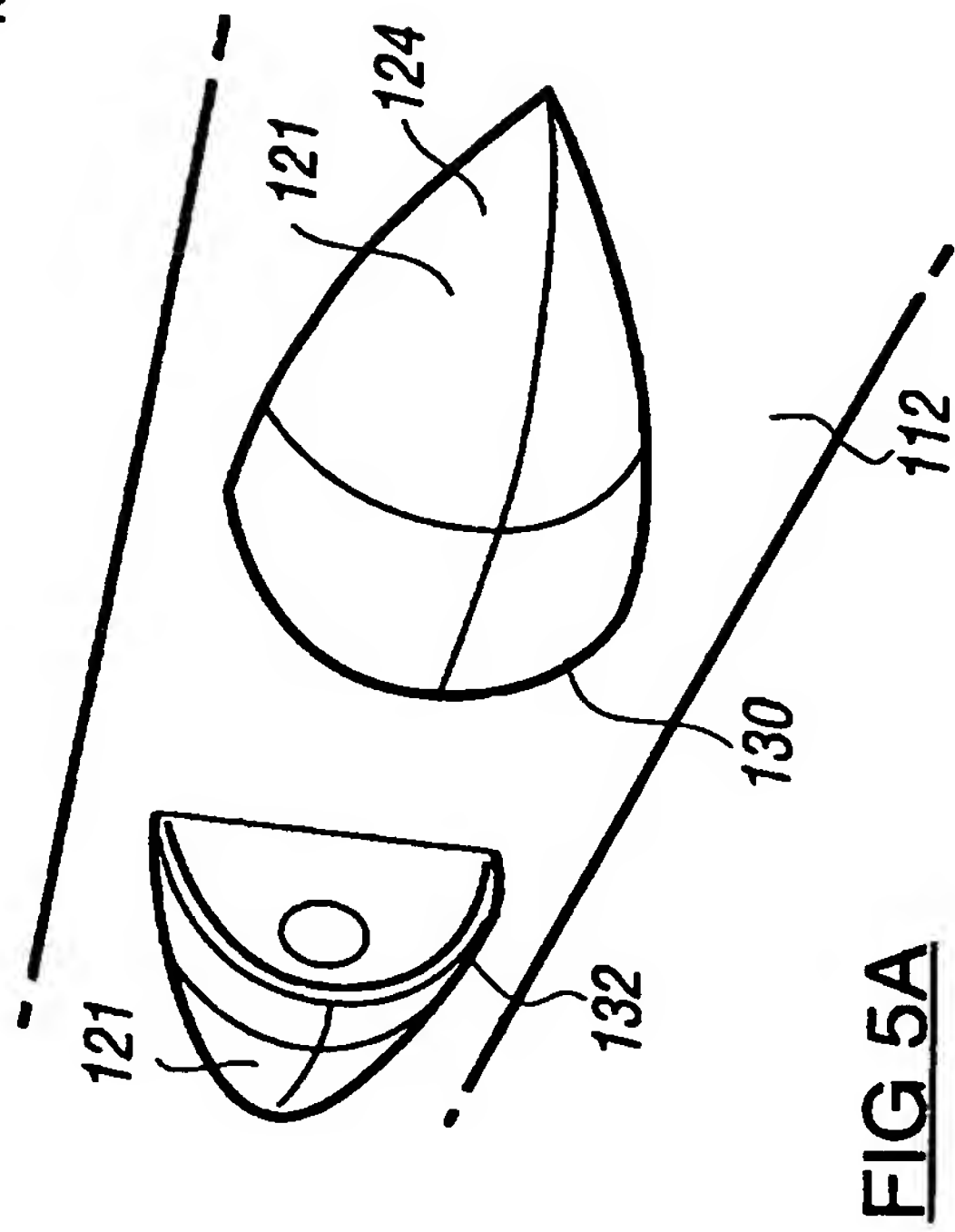
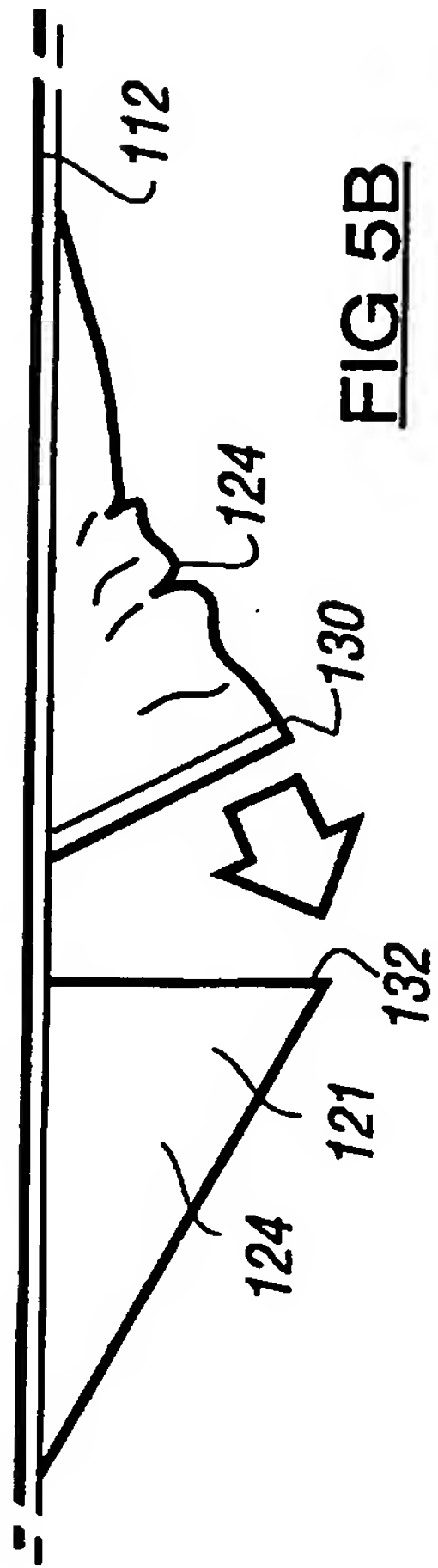
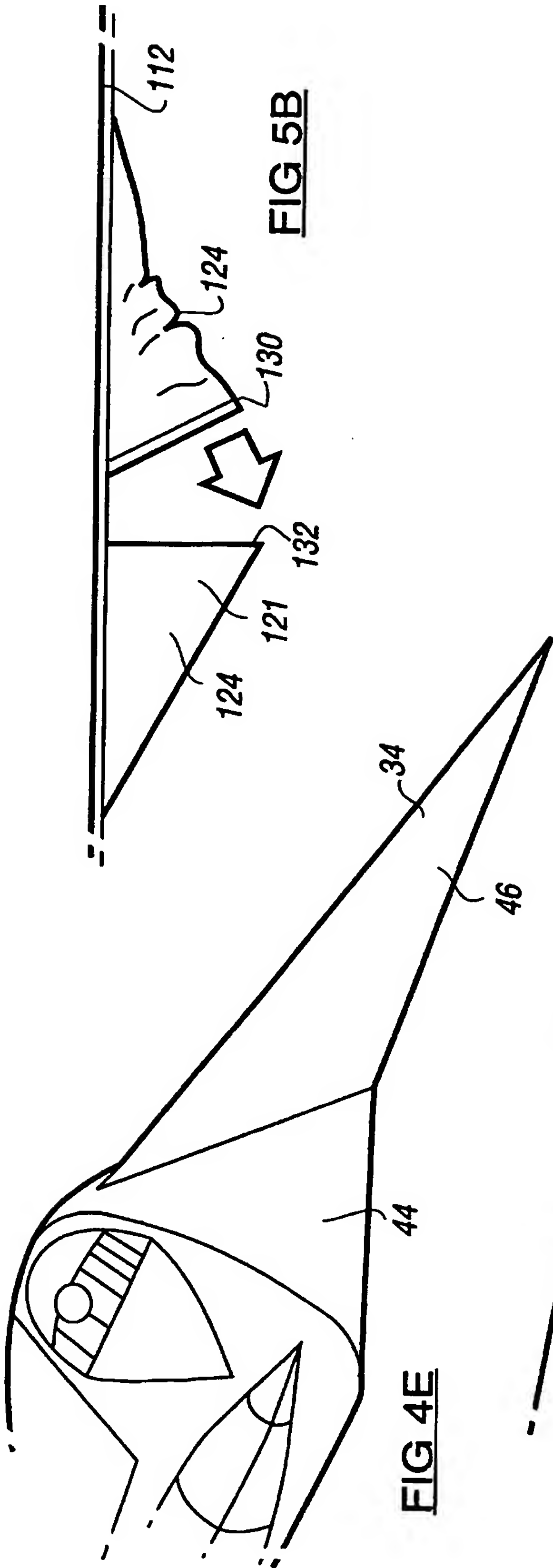


FIG 4D





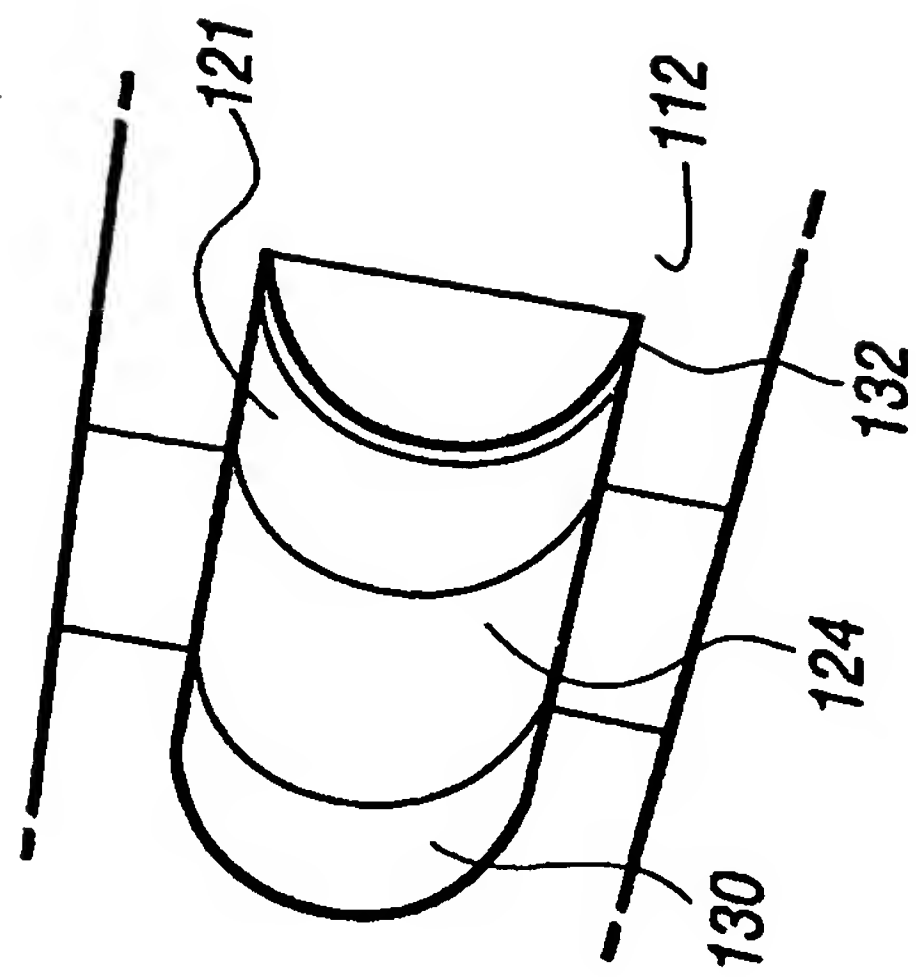


FIG 5D

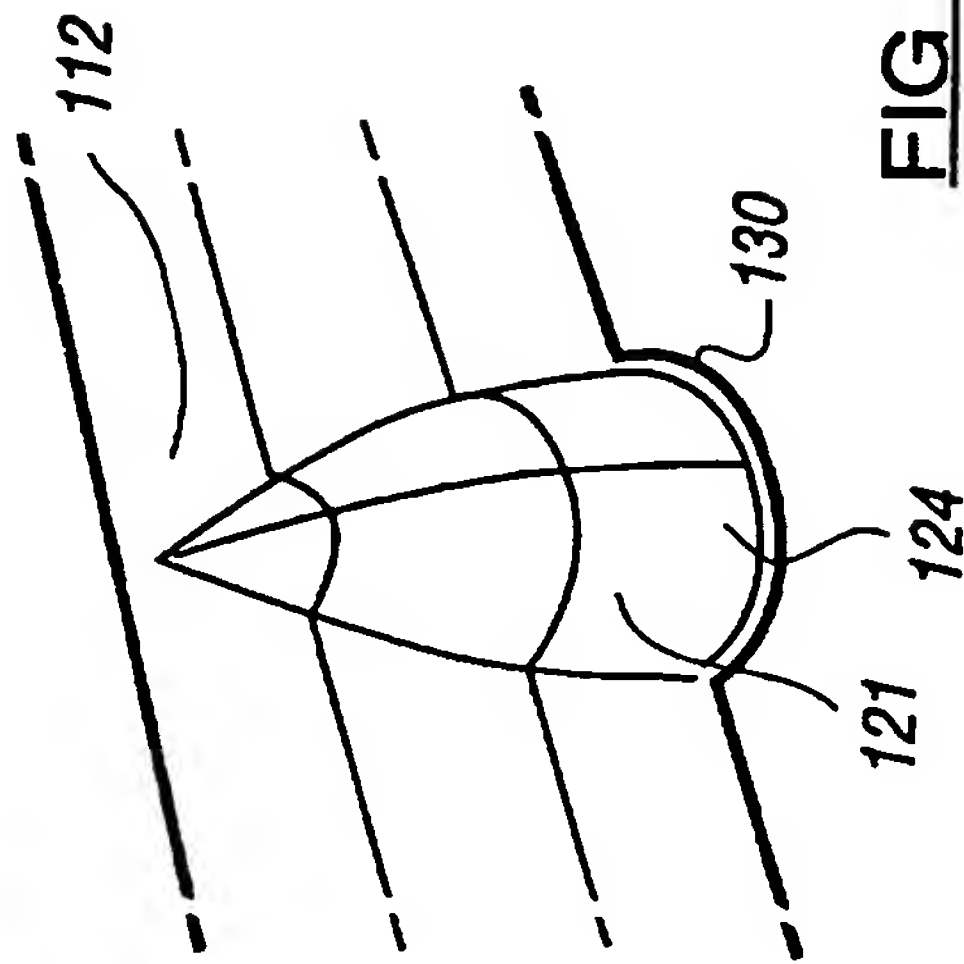


FIG 5E

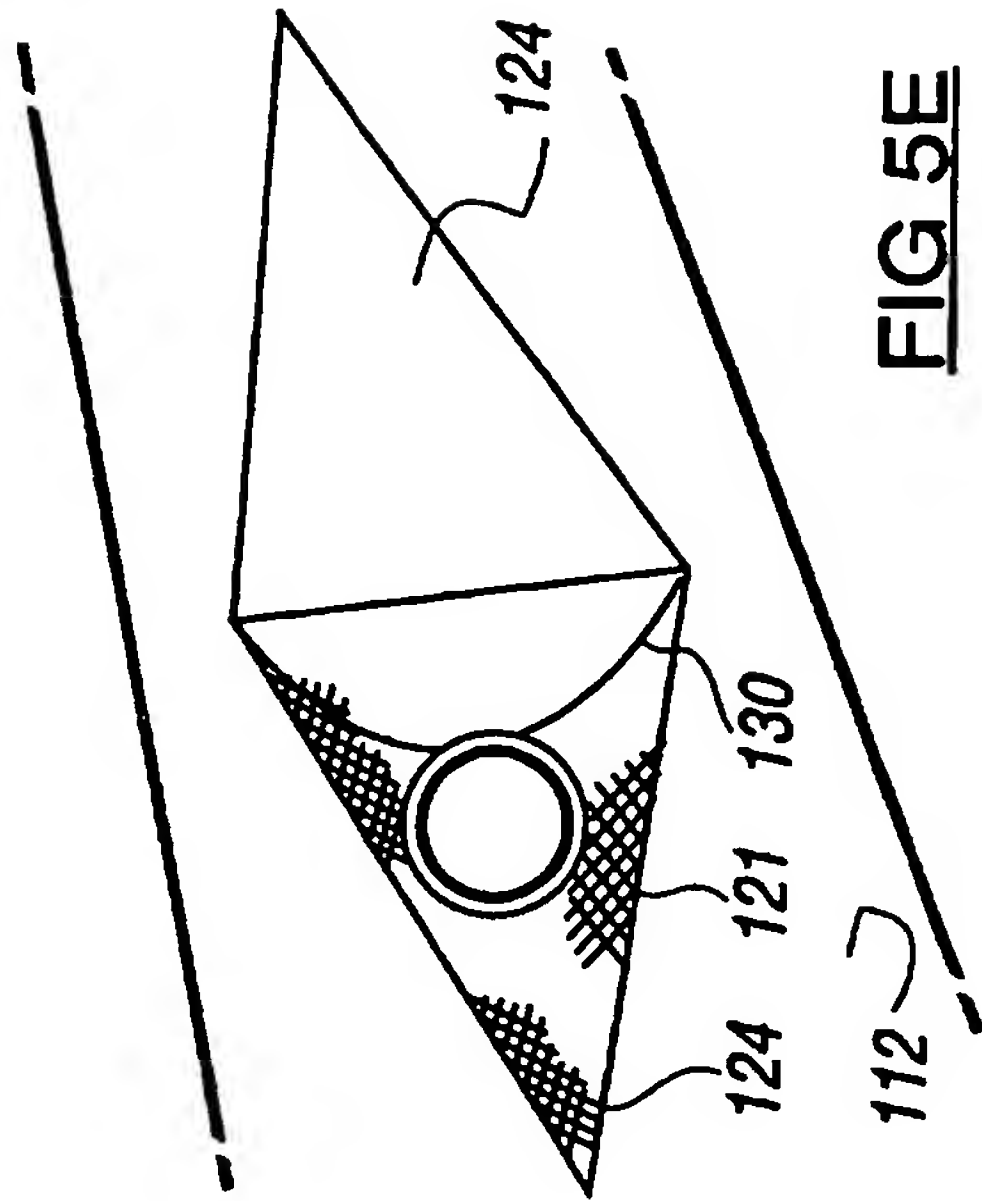


FIG 5F

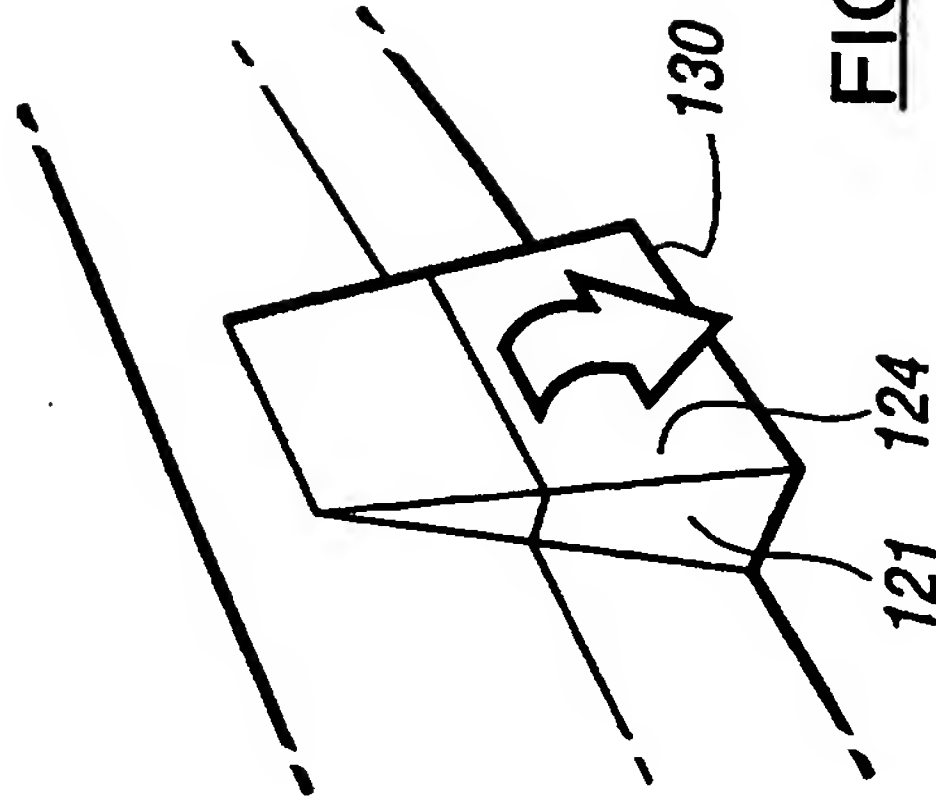


FIG 5G

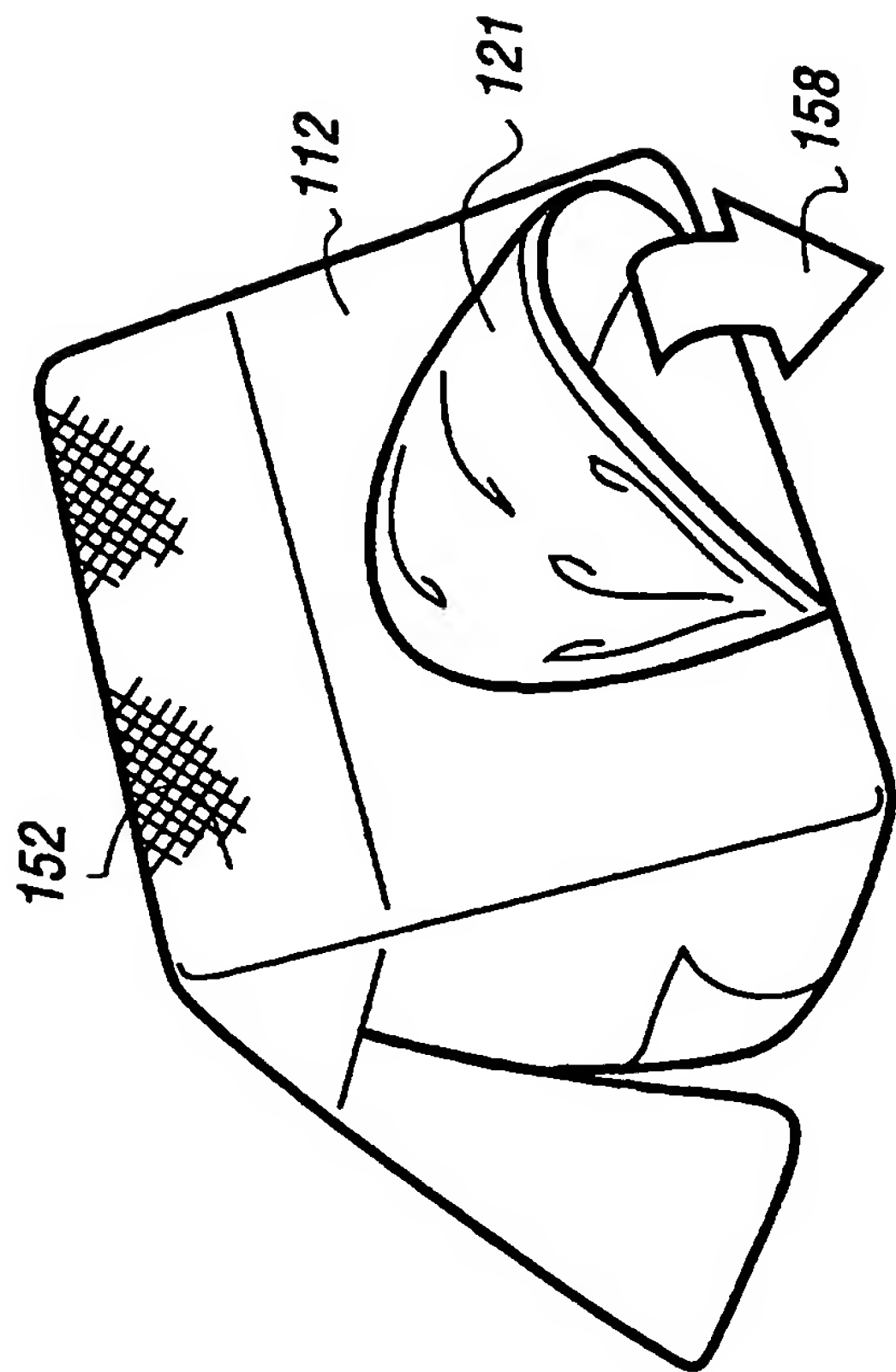


FIG 6B

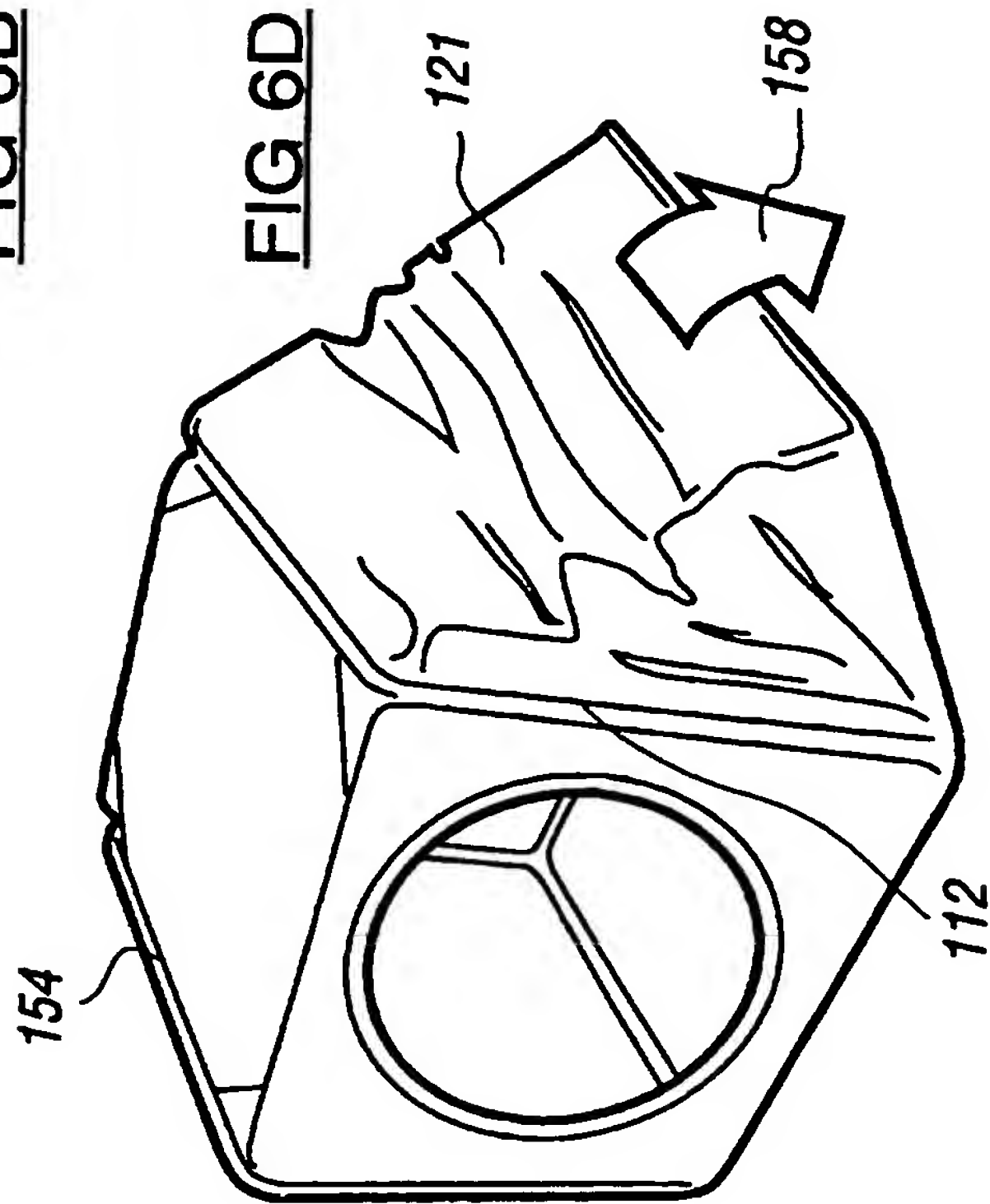


FIG 6D

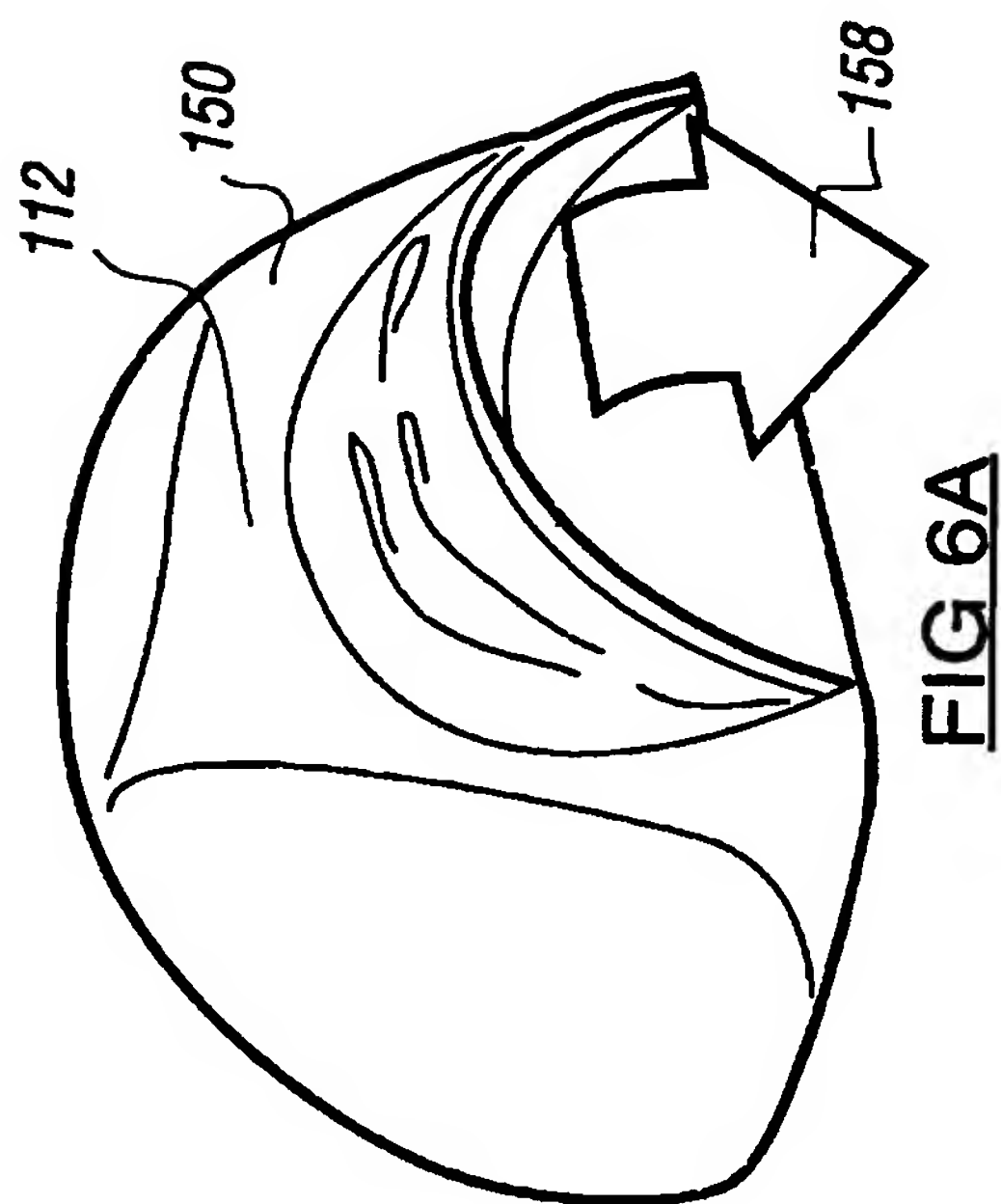


FIG 6A

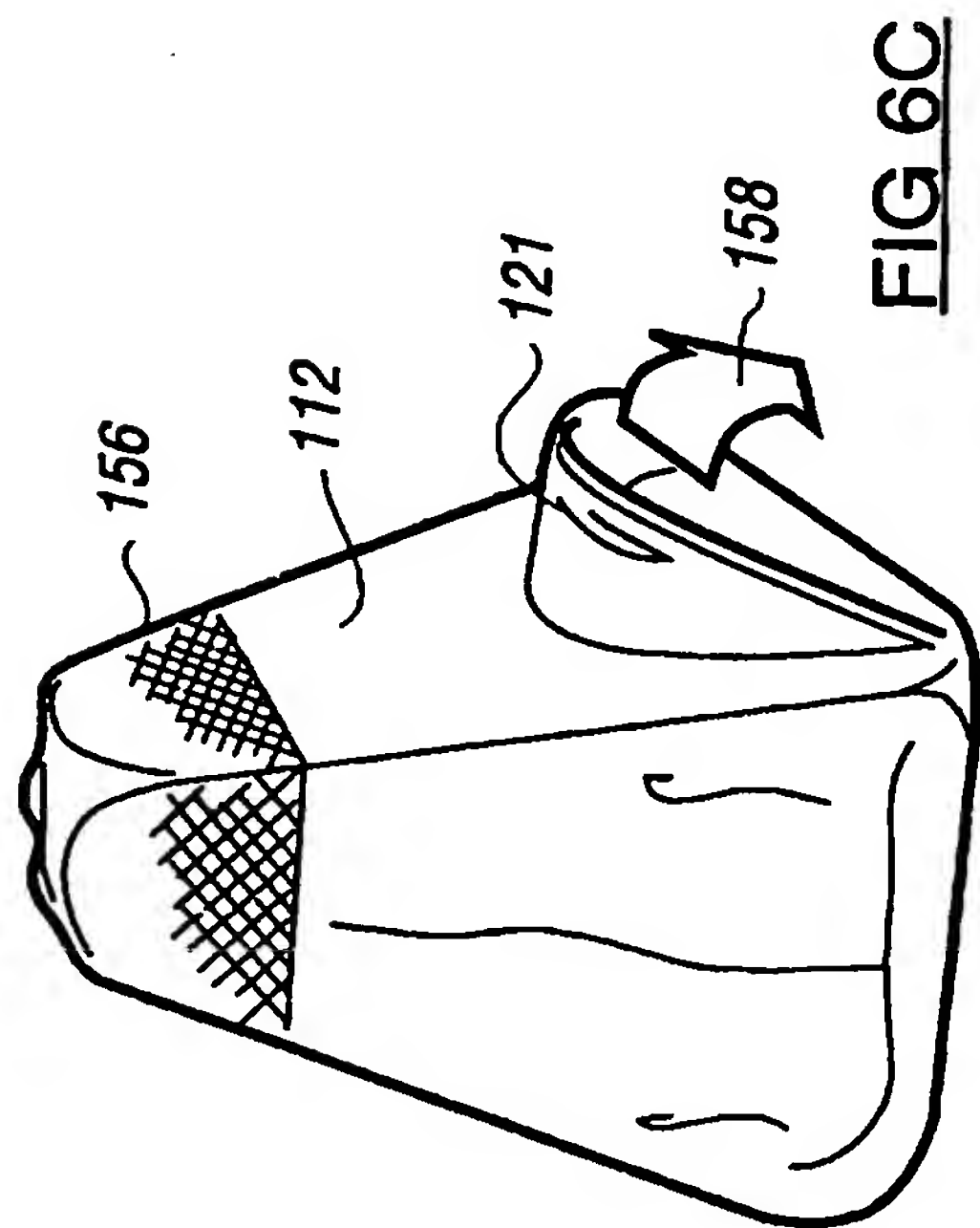


FIG 6C

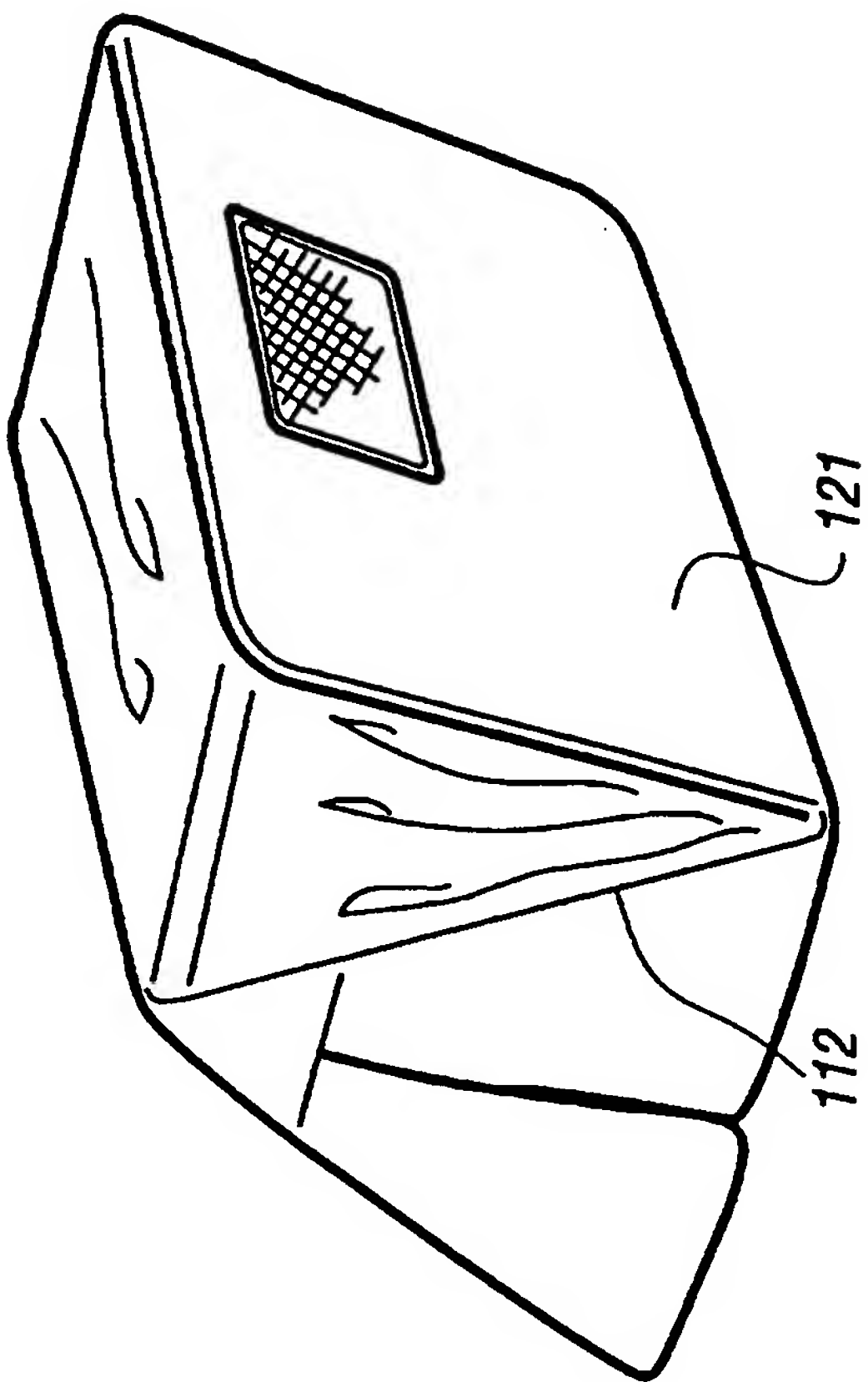


FIG 7B

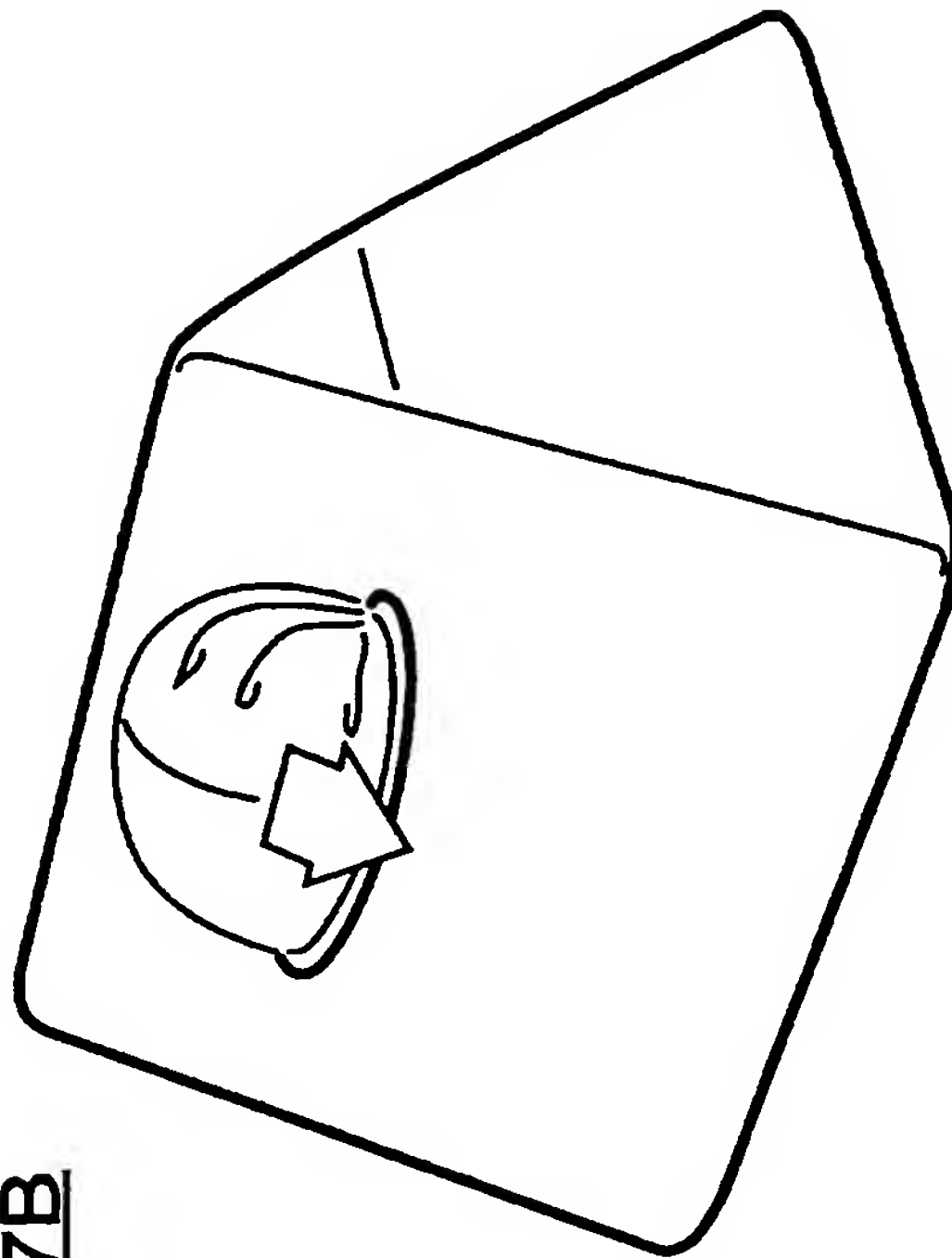


FIG7C

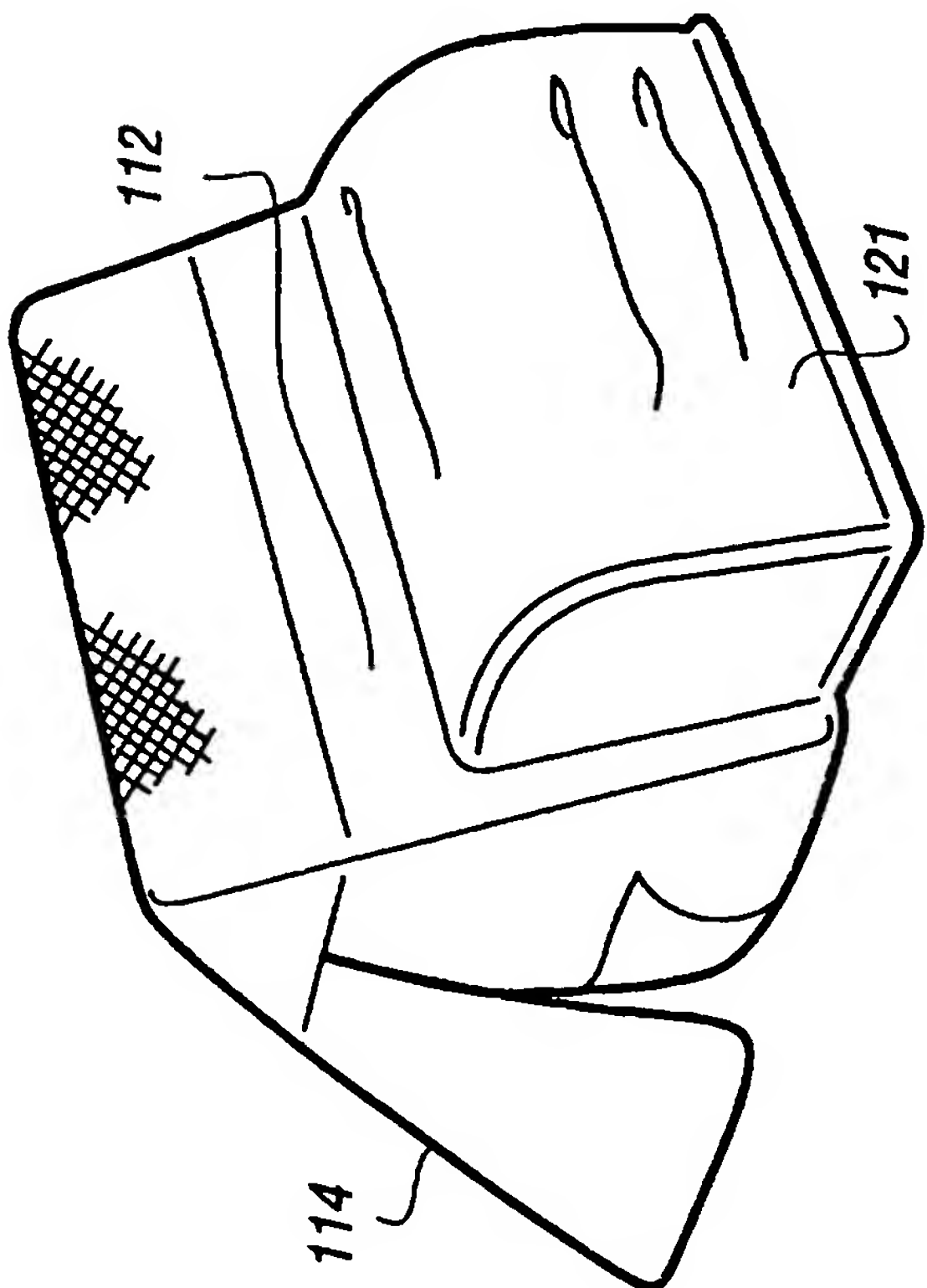
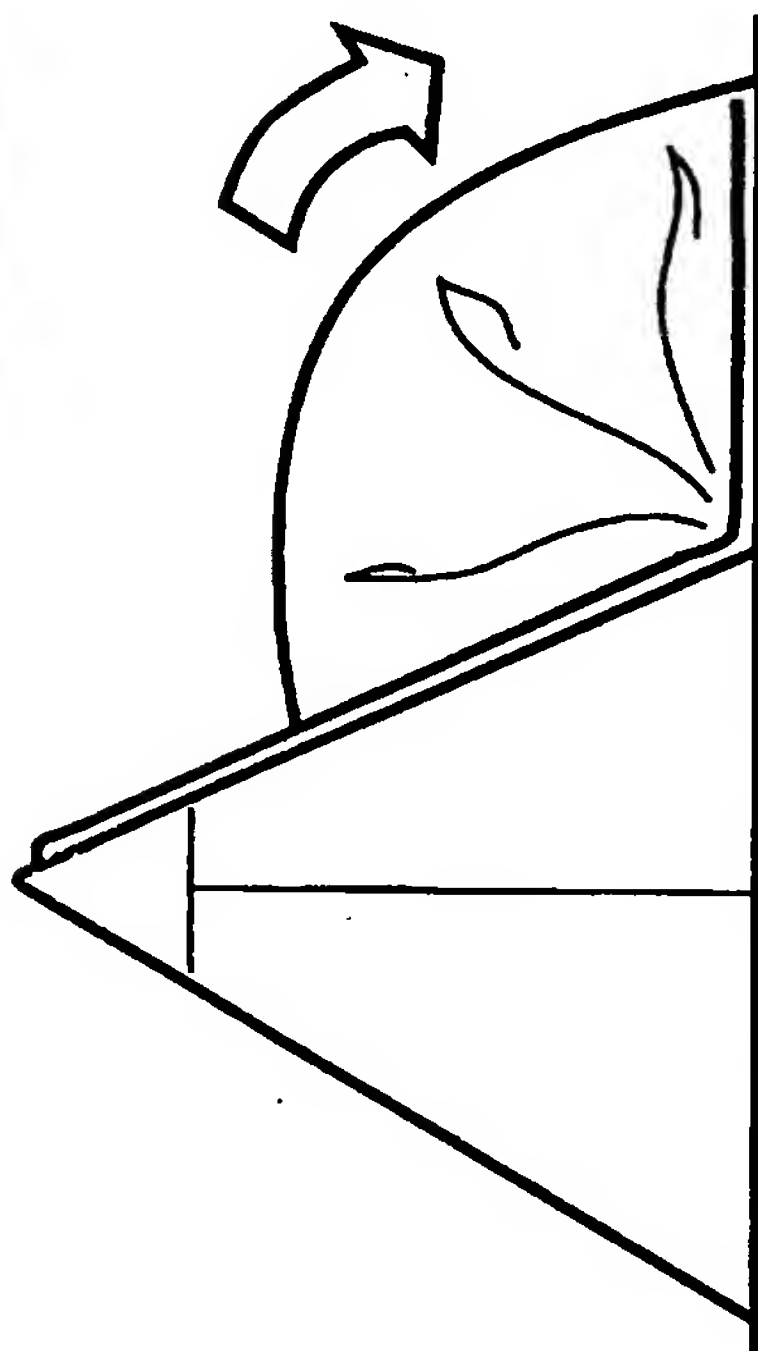
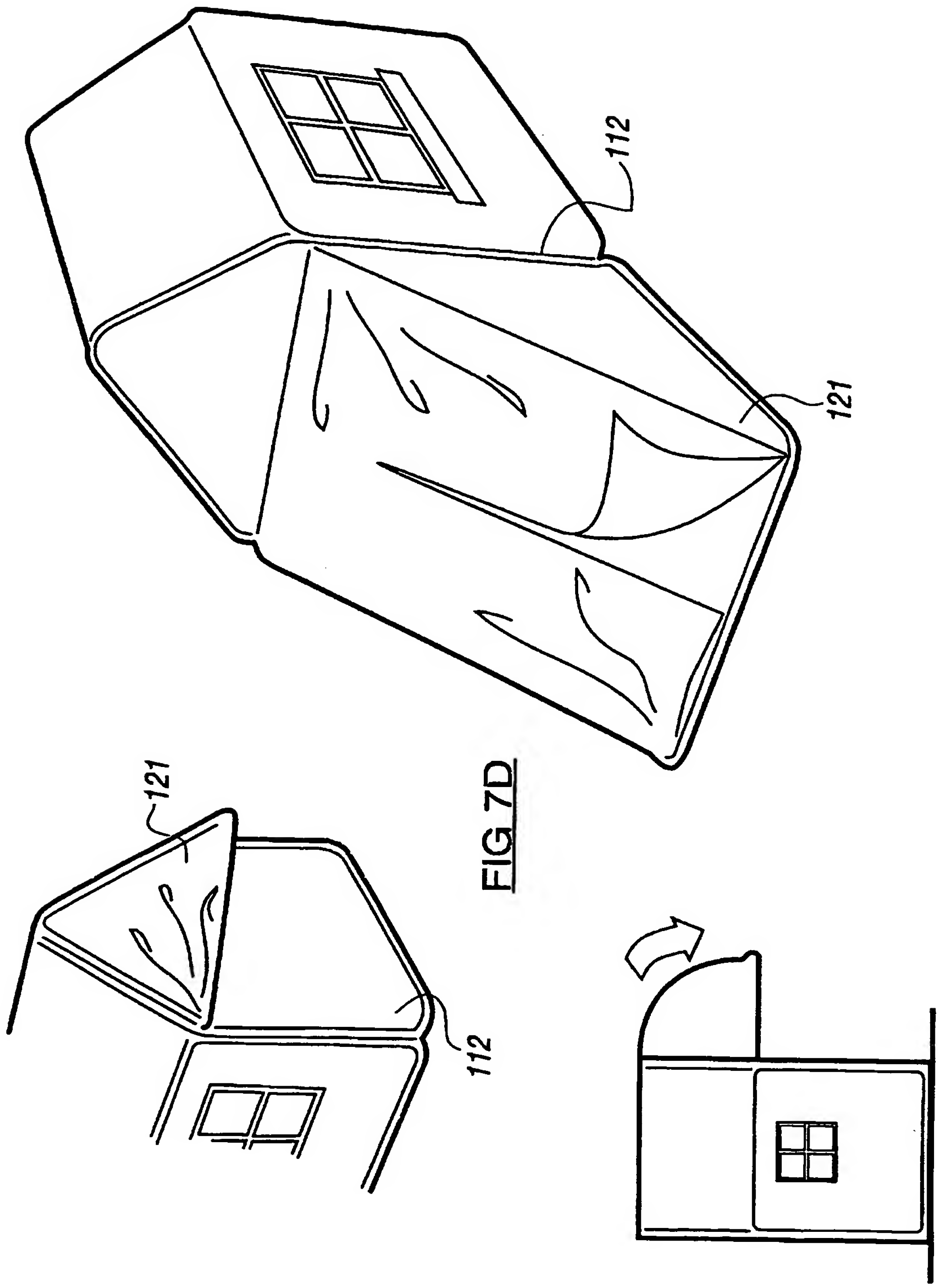


FIG 7A





## **Collapsible Structure**

The invention to which this application relates is a collapsible structure of the type where the structure is formed with side walls, a roof section and base section of flexible sheet material with said structure movable between a flattened storage condition and an erected in use position by manipulation of a frame or frame members which are held in location with the sheet material.

The frame is typically formed of a loop or loops of spring steel wire and said frame is biased towards an erected condition, in which condition the sheet material is held taut by the frame so that typically the side walls are held taut and depend outwardly, with the roof and/or base depending between the frame members. To move the structure to a flattened storage condition the frame hoop or hoops are manipulated into a series of smaller loops by crossing over the frame members and by folding the loops onto one another so that the structure can be moved to the flattened condition with the sheet material following the movement of the frame members. To move the structure from the flattened to erected condition the uncoiling of the loops leads to the same automatically springing out to form the structure in its erected condition.

This type of structure has been used to form tents for play by children, and use by adults, sunshades and the like but one common disadvantage is that the walls of the structure formed are planar as they depend between the frame members and this leads to the adaptability of design and visual appearance of the structures being limited.

It is an aim of the current invention to provide a collapsible structure which includes on at least one surface of the same a non-

planar feature which can be erected with and foldable with the structure.

In a first aspect of the invention there is provided a structure which comprises sheet material depending between at least one frame to form substantially planar walls of the structure, said structure movable between flattened and erected conditions by manipulation of the at least one frame and wherein said structure comprises at least one further portion of sheet material, which portion is located with a subframe and movable between a flattened condition and an erected condition to form a non planar feature depending from at least one of the said walls of the structure.

In one embodiment the said non-planar feature is moved between erected and flattened conditions in conjunction with the movement of the structure between said conditions to allow the same to be used as with a conventional structure of this type.

In one embodiment the sub-frame is formed from at least one of spring steel member which is attached to the main structure frame or to the sheet material of the structure and can be manipulated by hand between the erected and flattened conditions. In one embodiment the said sub-frame comprises a series of members of any suitable material, each of a desired shape and configuration and spaced apart as required to form the sheet material depending around said sub-frame into the required shape. The non-planar feature can also be provided in some instances with entry/exit apertures to the structure, ventilation or window apertures and be used in conjunction with features incorporated in the planar sheet material wall of the structure.

It is envisaged that the non planar feature or plurality of features can have a functional capacity such as, for example, providing

additional storage space areas, and/or for aesthetic purposes in which the feature, typically in conjunction with the structure shape, is shaped so as to provide or depict a character or item. It is envisaged that the aesthetic appearance is particularly attractive to children and in one embodiment the structure and additional features can be used to depict a futuristic space rocket.

In a further aspect of the invention there is provided a structure which comprises sheet material depending between at least one frame to form substantially planar walls of the structure, said structure movable between flattened and erected conditions by manipulation of the at least one frame and wherein said structure comprises at least one further portion of sheet material and said portion can be moved to an extended position and retained in that position when the structure is in an erected form.

In addition to the non planar feature or features formed as part of the structure, the structure may be used in conjunction with additional sheet material which can be provided integral to or attachable to the structure when erected and said sheet material can be moved to an extended condition to take a particular required form to further enhance the aesthetic appearance or utility of the overall structure.

In whichever embodiment it is envisaged that the frame of the structure will comprise a series of members, interlinked and when erected that sheet material is retained in that position until the frame is manipulated. In one embodiment the frame members are resilient members which are biased towards the erected condition but which can be coiled to move the structure to the flattened condition. In this embodiment a series of members are provided each interlinked by the sheet material to form the structure.



In yet a further aspect of the invention the structure is formed of at least three frame members interlinked by sheet material which passes between same, each of the members having portions located adjacent one another from which the same diverge.

Specific embodiments of the invention will now be described with reference to the accompanying drawings and photographs; wherein

Figures 1A-F illustrate various views of one embodiment of the invention;

Figures 2A-C illustrate views of the non planar feature of the structure in one embodiment of the invention;

Figures 3A-B are photographs which show the non planar feature incorporated in a structure in accordance with the invention;

Figures 4A-D show the use of additional sheet material to form further features of the structure in accordance with one embodiment of the invention;

Figures 5A-G show further non-planar features which can be provided in accordance with the invention;

Figures 6A-D illustrate non-planar features provided in connection with structures of conventional shape; and

Figures 7A-F illustrate further embodiments of non-planar features.

Referring firstly to Figures 1A-F there is shown a structure 2 which comprises a frame 4 formed of two members in the form of loops 6,8 in Figures 1A-C, and three loops 6,7,8 in Figures 1D-F, of spring steel which are held in hinged proximity along common edges 10, by

sheet material which depends between and around the loops and which, when the structure is in the erected condition shown, forms the side walls 12,14, base 16 and end walls 18,20. Also provided in the structure in accordance with the invention are additional non planar features 21,22. These features are each formed of portions of sheet material 24,26 which are each attached to a side wall 12, 14 as shown. The portions define an opening 28 which is defined by frame members 30,32, the use of which is described in relation to the following drawings.

In addition to the non planar features, further sheet material 34, 36 is provided which can be moved to an extended position to depend from the end wall 18 as shown and this sheet material is provided to be held in the extended condition shown by frame members and the operation of the same is described with reference to the following drawings.

To move the tent structure between erected and flattened conditions, the release and flattening of the non planar features 21,22 and/or sheet material 34,36 is performed whereupon manipulation of each of the members 6,8 to form the same from a series of coded loops into an extended hoop is performed in a conventional manner.

Referring now to Figures 2A-C and 3A-B there is illustrated in greater detail the non planar feature 21 in erected condition and the Figures 3A and B illustrate how the portions of sheet material used can be of different colour and/or texture to enhance the visual effect of the same. Figure 2A illustrates a plan view of the feature 21 in an erected condition with the sheet material portions 24,26 and frame members 30,32 joined together and how they can be held in that position by a batten 38 which depends from the side wall of the structure and/or tab 39. Figures 3A-B illustrate how the sheet

material portions 24,26 are shaped to form the non planar feature shape when held in this erected condition. Figure 2B illustrates how, by moving the frame members 30,32, apart as indicated by arrows 40 the non planar feature can be flattened to lie flat against the side wall of the structure and then allow the remainder of the structure to be moved to the flattened condition.

Figure 3A illustrates that the side wall of the structure is provided with an aperture 42 enclosed by the non-planar feature which can be provided for visual purposes and/or can be used as an other means of access into the structure, and/or as a window or ventilation structure.

Figures 4A-E illustrate a further feature of the invention in the form of additional sheet material portions 34,36 and the manner in which the same are extended from the end wall of the structure. An entry/exit 44 is provided and the sheet material portions 34,36 are extended to each side of the entry/exit to add to the visual appearance of the structure and mask the entry/exit from being viewable from the sides of the structure. Each of the sheet material portions can be moved to the extended position by the provision of poles 46 which extend the sheet material.

Figures 5A-G illustrate further embodiments of a non-planar feature in similar forms to those described in figures 1A – 3B. In each case, it will be clearly seen that the non-planar feature 121 protrudes outwardly from a wall or side of a structure to form a non-planar feature in relation to that wall or side 112. It is also shown how each non-planar feature comprises sheet or flexible material 124 used in conjunction with a sub-frame or sub-frame members 130,132 which, when moved to an extended condition, form the sheet material into the non-planar feature as shown. It is also shown how the feature can take any of a number of shapes and

how engagement means 123 can be provided to maintain the non-planar feature in the erected condition.

Figures 6A-D illustrate the provision of non-planar features in a more conventional tent structure which is shown in four different formations 150, 152, 154 and 156. In each case however a non-planar feature 121 is provided in conjunction with one of the walls 112 of the structure and the non-planar feature can be moved as indicated by the arrows 158 between the flattened condition to an erected condition when the tent structure is erected as shown. It will immediately be appreciated that, in addition to providing an additional feature to the appearance of the tent structure, the non-planar feature provides additional space thereby allowing the enlargement of the structure without significantly increasing the storage space required, as the non-planar feature can fold with the structure to a flattened storage condition. It is also envisaged that in the embodiment shown, retaining means will be provided so as to maintain the non-planar feature in the erected condition and said means may be Velcro to allow the non-planar feature to engage with the carpet or other material on a surface and/or alternatively pegs which can be inserted into soil, sand if the structure is for use outdoors.

Figures 7A-F illustrate yet further structure arrangements with a non-planar feature and illustrate further uses of the non-planar feature in addition to providing a visual effect. For example, in Figure 7A there is provided a ridge tent structure and the wall surface 112 is provided with a non-planar feature 121 which extends outwardly from the same and would allow, for example, the structure to be extended for additional sleeping space so that a person, for example in a sleeping bag, could fit into the non-planar feature within the structure.

Figure 7B illustrates a further variation on this wherein, in this case rather than the floor space of the structure being extended, the head space is extended so that in daytime use for persons moving about within the structure, the space available is increased by the extension of the non-planar feature 121. Indeed it is possible that the combination of Figures 7A and 7B would arrive at a structure with one side wall 112 provided with the non-planar feature 121 as shown in Figure 7A and the other side wall 114 as shown in Figure 7A being provided with a non-planar feature 121 as shown in Figure 7B so that one structure is provided with more than one non-planar feature to significant advantage.

The figures 7D-F illustrate playhouse structures with additional features which again, in Figure 7D illustrates the floor space of the structure and in figures 7E and F, the extension of the non-planar feature to an erected condition provides additional head space which can be used to depict a loft or shelf space for storage in which toys, games or other articles may be provided.

It should be appreciated that although the examples show the use of a frame or frame members which are of spring steel and which can be manipulated by the coiling of the same to move the structure to a flattened condition, and uncoiling to move the structure to an erected condition, the frame can be provided in any conventional form such as constructed from a series of members. In this case the frame is manipulated from a flattened to erected condition by joining the frame members together in any conventional manner to form the frame which supports the sheet material, and can be manipulated to a flattened condition by unfastening and disassembling the frame members. Thus, the current invention is not confined or restricted to a structure having only one type of frame.

It should therefore be appreciated that all of the non-planar features described in the various drawings can be used in isolation or in combination to provide the required effects on one structure. In some instances, the non-planar features are provided to improve the visual appearance of the structure and in others the non-planar features can be provided to improve the utility of the structure, especially when erected to improve and increase the available space of the same. However, in whichever form, the non-planar feature can be moved to a flattened condition by manipulation of the frame.



Claims

1. A structure which comprises sheet material depending between at least one frame to form substantially planar walls of the structure, said structure movable between flattened and erected conditions by manipulation of at least one frame and wherein said structure comprises at least one further portion of sheet material, which portion is located with a sub-frame and movable between a flattened condition and an erected condition to form a non-planar feature on at least one of said walls of the structure.
2. A structure according to claim 1 wherein the structure is in the form of a tent-like structure having side walls and a base.
3. A structure according to claim 1 wherein the at least one non-planar feature is moved between erected and flattened conditions in conjunction with the movement of the structure between said conditions.
4. A structure according to claim 1 wherein the sub-frame is formed from at least one spring steel member which is attached to the main structure frame or to the sheet material structure.
5. A structure according to claim 1 wherein said sub-frame comprises a series of members of suitable material, each of a desired shape and configuration and spaced apart as required to form the sheet material depending around said sub-frame into the required shape.
6. A structure according to claim 1 wherein the sub-frame is located in conjunction with entry or exit apertures to the structure, ventilation or window apertures to the structure.

7. A structure which comprises sheet material depending between at least one frame to form substantially planar walls of the structure, said structure movable between flattened and erected conditions by manipulation of the at least one frame and wherein said structure comprises at least one further portion of sheet material and said portion can be moved to an extended position and retained in that position when the structure is in an erected form.
8. A structure according to claim 7 wherein the additional sheet material is provided integral with the sheet material of the structure.
9. A structure according to claim 7 wherein the additional sheet material is attachable to the structure when erected and the sheet material can be moved to an extended condition to take a particular required form.
10. A structure according to any of the preceding claims wherein the frame structure comprises a series of members interlinked and, when erected, the sheet material is retained in that position by the frame until further manipulation of the frame members.
11. A structure according to claim 10 wherein the frame members are resilient members which are biased towards the erected condition and which can be coiled to move the structure to the flattened condition.
12. A structure according to claim 11 wherein the series of members are interlinked by the sheet material to form the structure.
13. A structure comprising a frame from which depends sheet material and which structure can be moved between erected and flattened conditions and wherein the frame is formed from at least three frame members interlinked by sheet material which passes



between the same, each of the members having a portion located adjacent one another and from which location the remainder of each of the frame members diverge.

**Amendments to the claims have been filed as follows**

1. A structure which comprises sheet material depending between at least one frame to form substantially planar walls of the structure, said structure movable between flattened and erected conditions by manipulation of at least one frame with the sheet material following the movement thereof and, wherein said structure comprises at least one further portion of sheet material, which portion is located with a sub-frame, with both the sub-frame and sheet material movable between a flattened condition and an erected condition to form a non-planar feature on at least one of said walls of the structure.
2. A structure according to claim 1 wherein the structure is in the form of a tent-like structure having side walls and a base.
3. A structure according to claim 1 wherein the at least one non-planar feature is moved between erected and flattened conditions in conjunction with the movement of the structure between said conditions.
4. A structure according to claim 1 wherein the sub-frame is formed from at least one spring steel member which is attached to the main structure frame or to the sheet material structure.
5. A structure according to claim 1 wherein said sub-frame comprises a series of members of suitable material, each of a desired shape and configuration and spaced apart as required to form the sheet material depending around said sub-frame into the required shape.
6. A structure according to claim 1 wherein the sub-frame is located in conjunction with entry or exit apertures to the structure, ventilation or window apertures to the structure.



Application No: GB 9911654.3  
Claims searched: 1-6

Examiner: Dr. Robert Fender  
Date of search: 30 June 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): E1D: TNC, TND, TNF, TNH

Int Cl (Ed.6): E04H

Other: Online: WPI, EPODOC

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	US 5240021 (Snodgrass) see figures 1 & 2	1, 2, 5 & 6
X	US 4858635 (Eppenbach) see figures 1 & 2	1, 2, 5 & 6
A	WO 97/43508 A1 (Bendit) see figure 2	-
A	US 5301705 (Zheng) see figures 1-3	-

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